EXHIBIT 1

US 20160107775A1

(19) **United States**

(12) **Patent Application Publication**

Amacker et al.

(10) **Pub. No.: US 2016/0107775 A1**

(43) **Pub. Date: Apr. 21, 2016**

(54) **STRAPPING ARRANGEMENT**

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(21) Appl. No.: **14/787,966**

(22) PCT Filed: **May 5, 2014**

(86) PCT No.: **PCT/CH2014/000059**

§ 371 (c)(1),
(2) Date: **Oct. 29, 2015**

(30) **Foreign Application Priority Data**

May 5, 2013	(CH)	910/13
May 5, 2013	(CH)	911/13
Sep. 24, 2013	(CH)	1629/13
Sep. 24, 2013	(CH)	1630/13
Mar. 24, 2014	(CH)	443/14

Publication Classification

(51) **Int. Cl.**

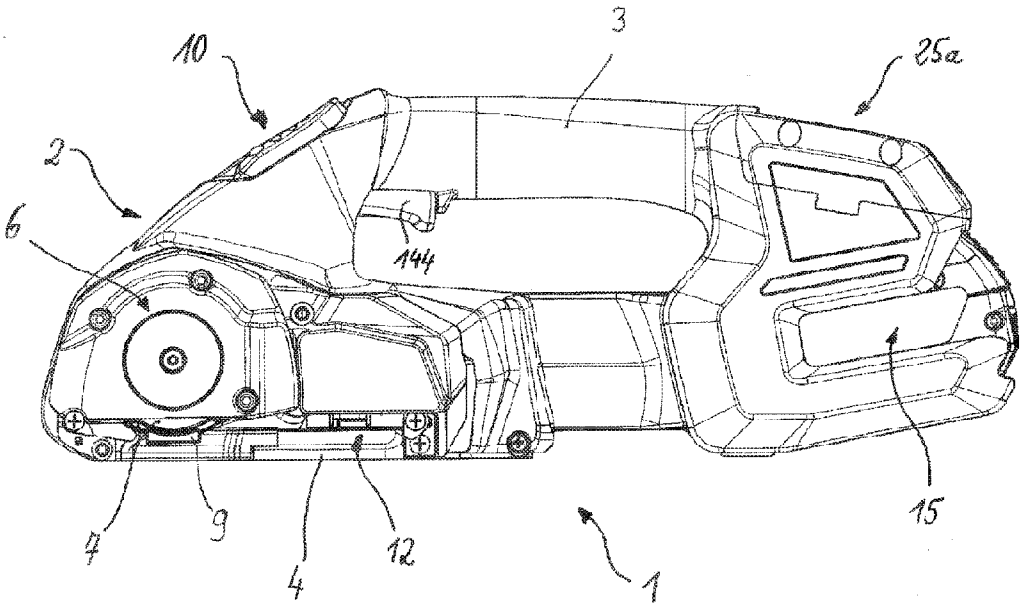
B65B 13/02	(2006.01)
B65B 13/32	(2006.01)
B65B 13/18	(2006.01)

(52) **U.S. Cl.**

CPC ***B65B 13/025*** (2013.01); ***B65B 13/187*** (2013.01); ***B65B 13/327*** (2013.01)

(57) **ABSTRACT**

Various embodiments of the present disclosure are directed to a mobile strapping device for wrapping material to be packed with a strap. The device includes a tensioning wheel and a tensioning plate, at least one of which is mounted on a pivotable rocker. The strapping device includes a motor operatively coupleable to the tensioning wheel to rotate the tensioning wheel and to the rocker to pivot the rocker. The strapping device includes an actuating device actuatable to switch the state of gearing from operatively coupling the motor to the tensioning wheel to operatively coupling the motor to the rocker.



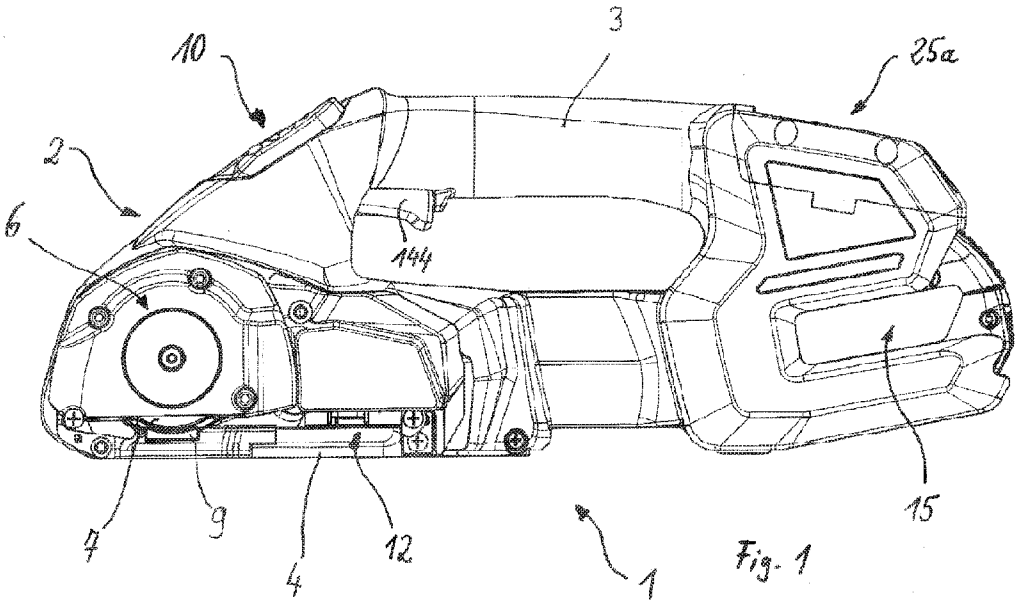


Fig. 1

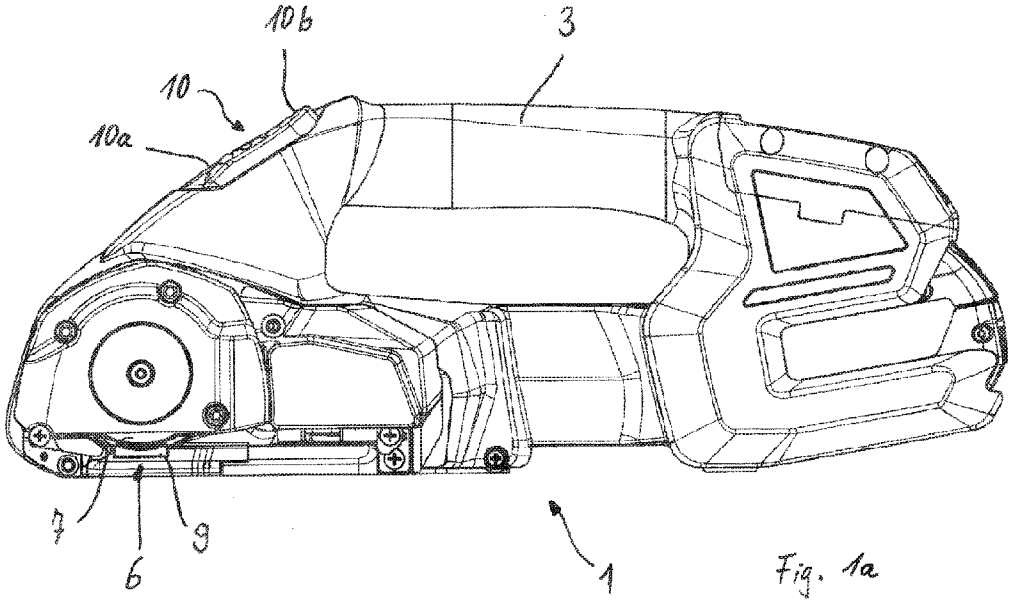


Fig. 1a

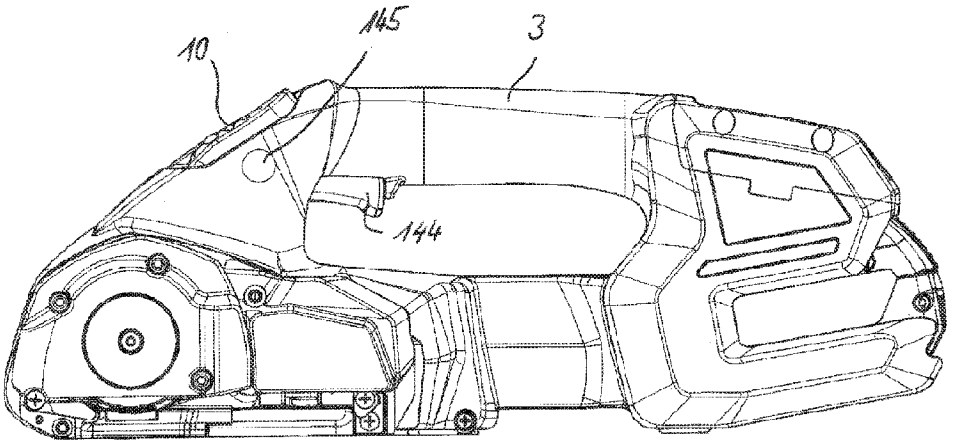


Fig. 1b

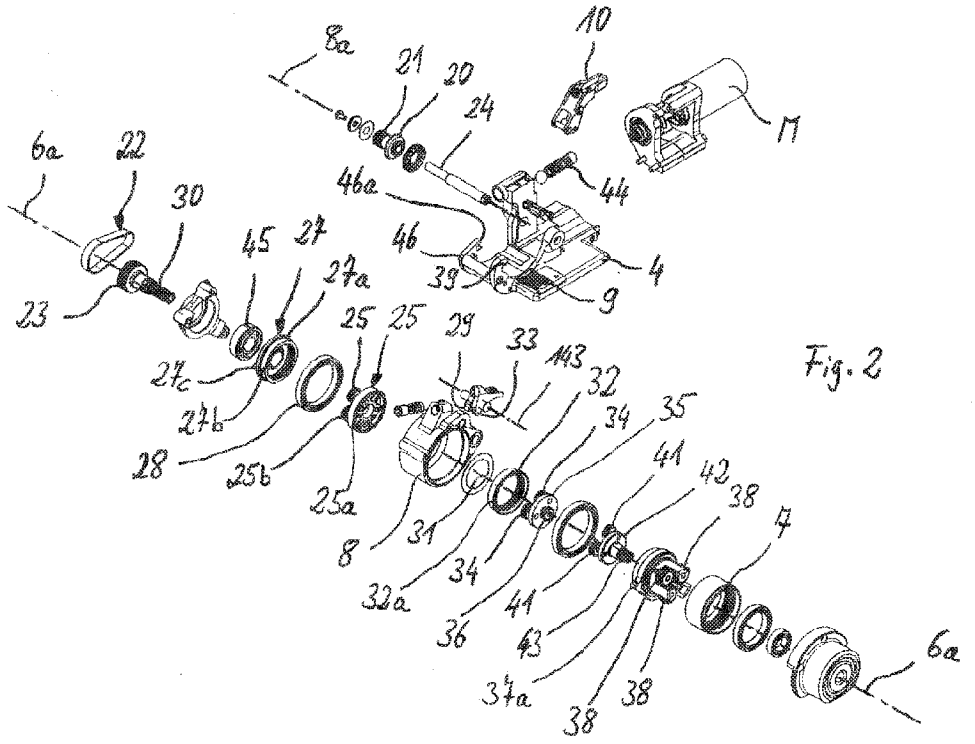

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Fig. 2

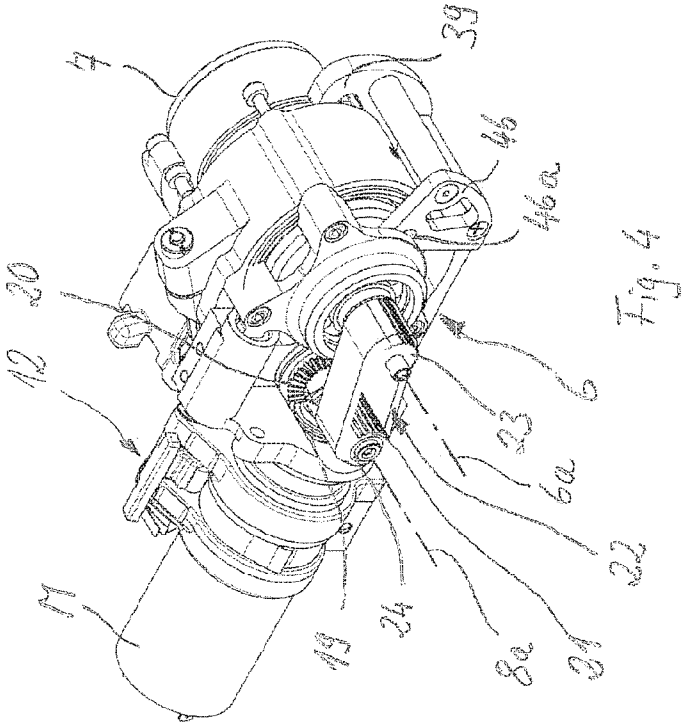

Fig. 4

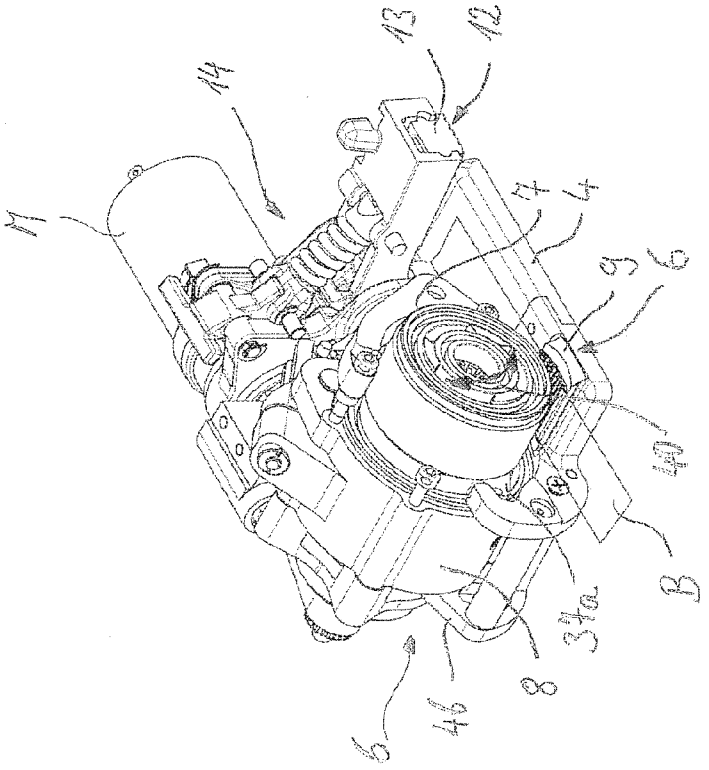

Fig. 3

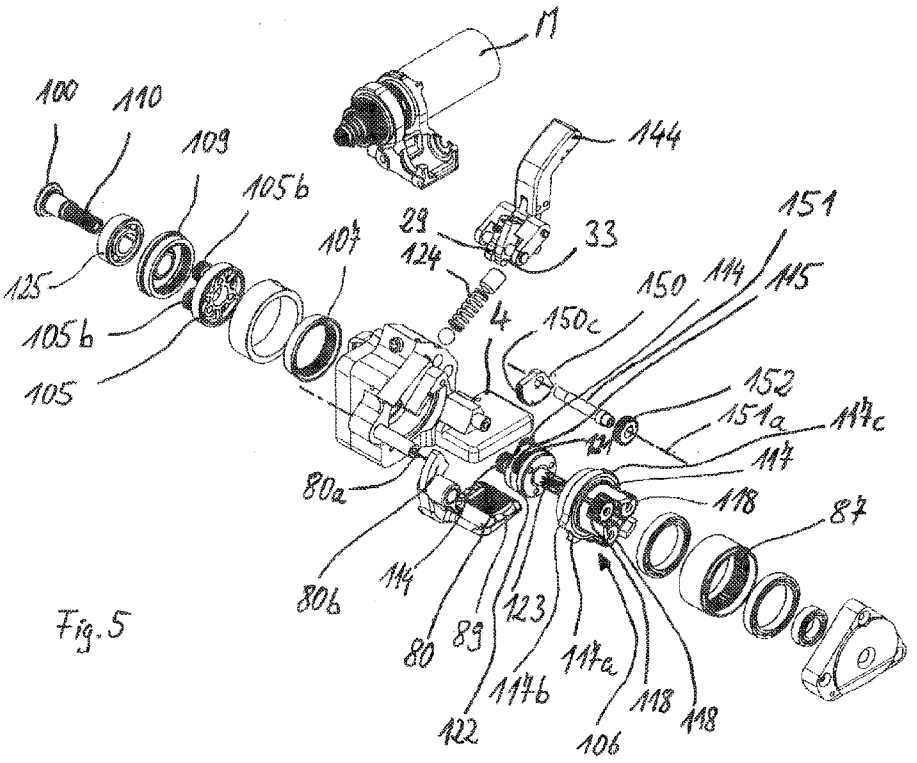
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Fig. 5

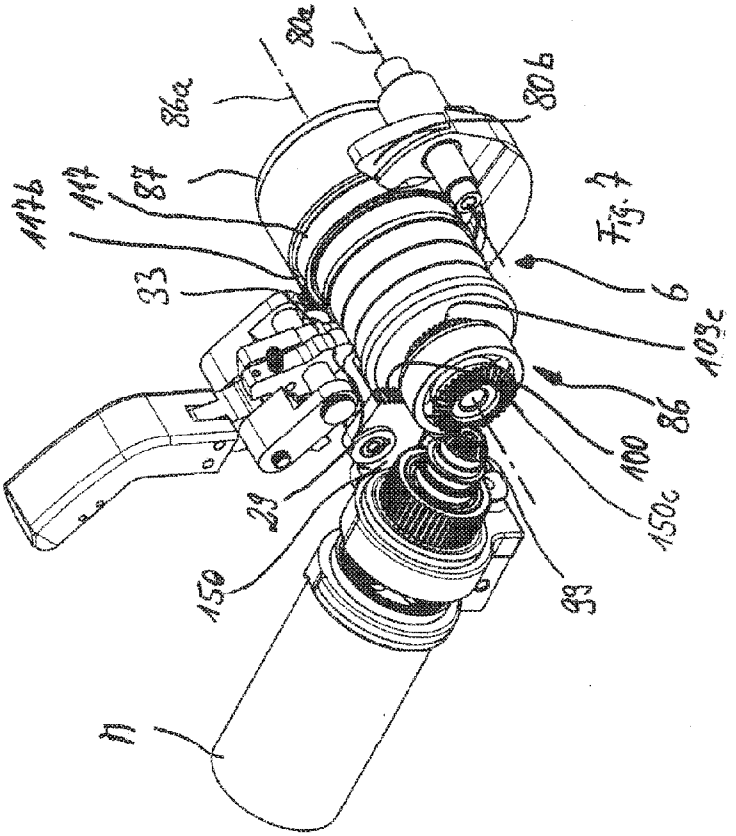
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Fig. 7
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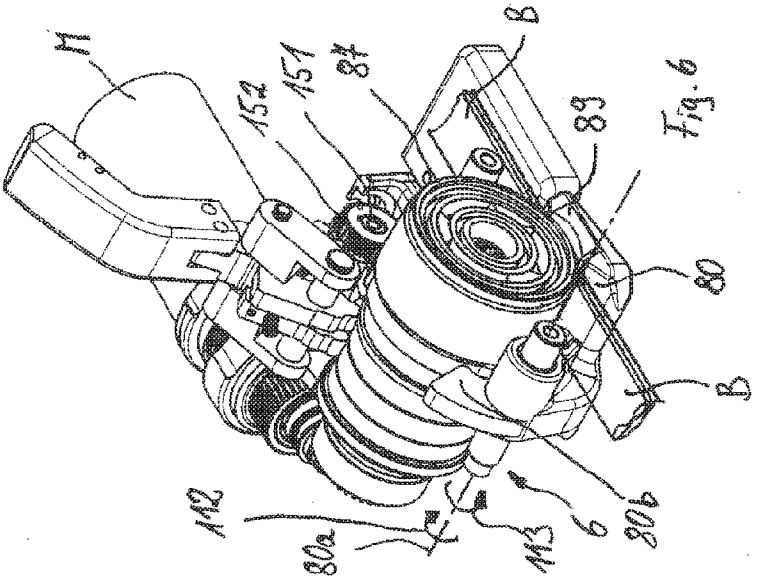
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Fig. 6
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80a
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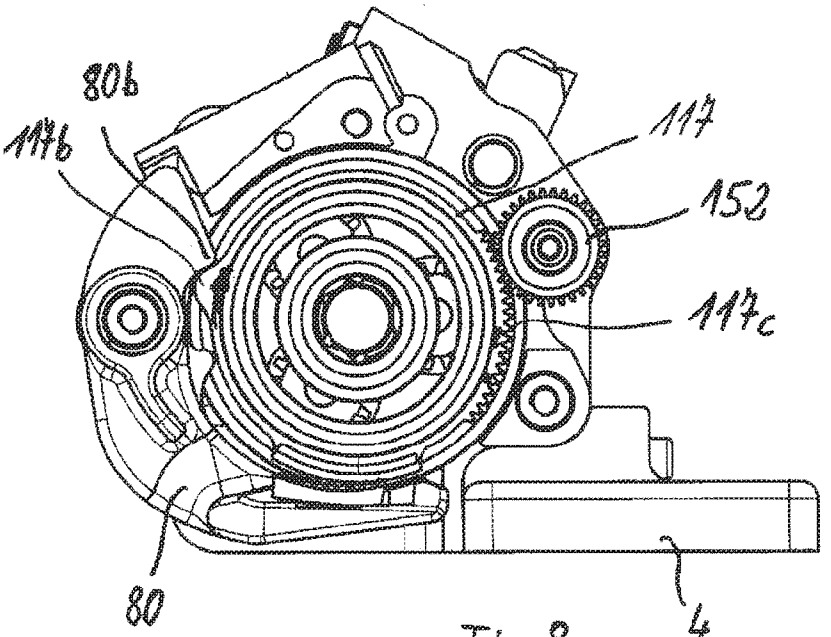

Fig. 8

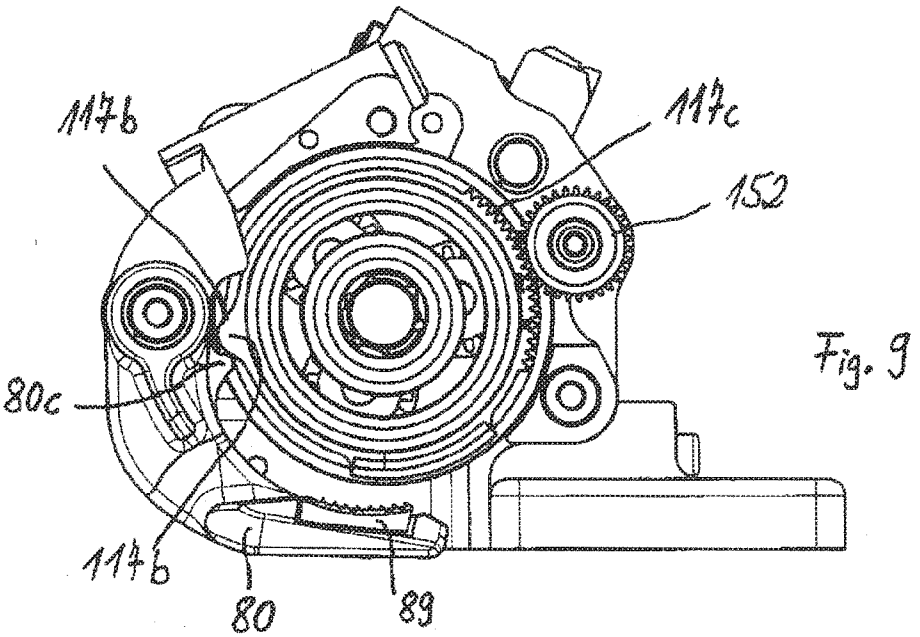

Fig. 9

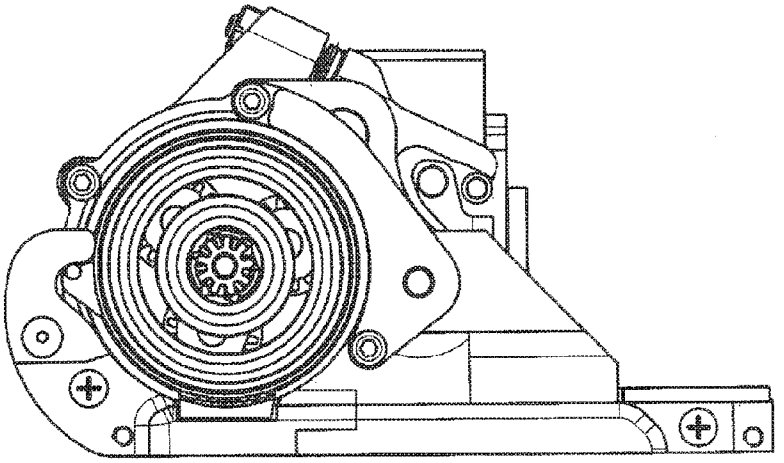

Fig. 10

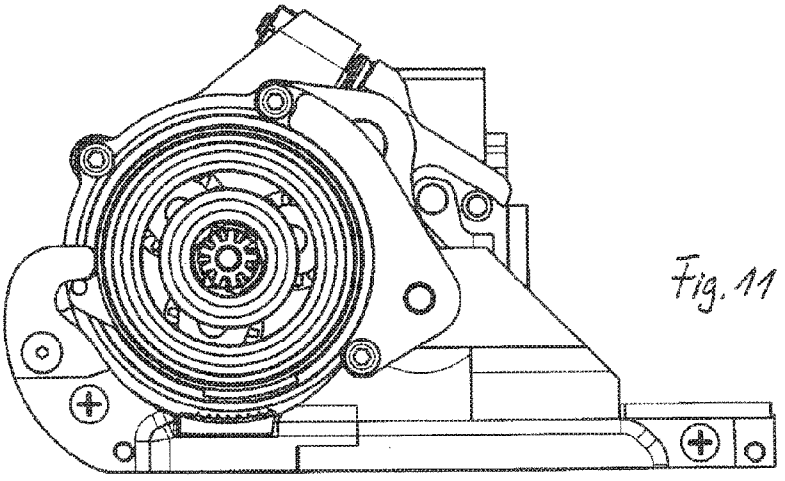

Fig. 11

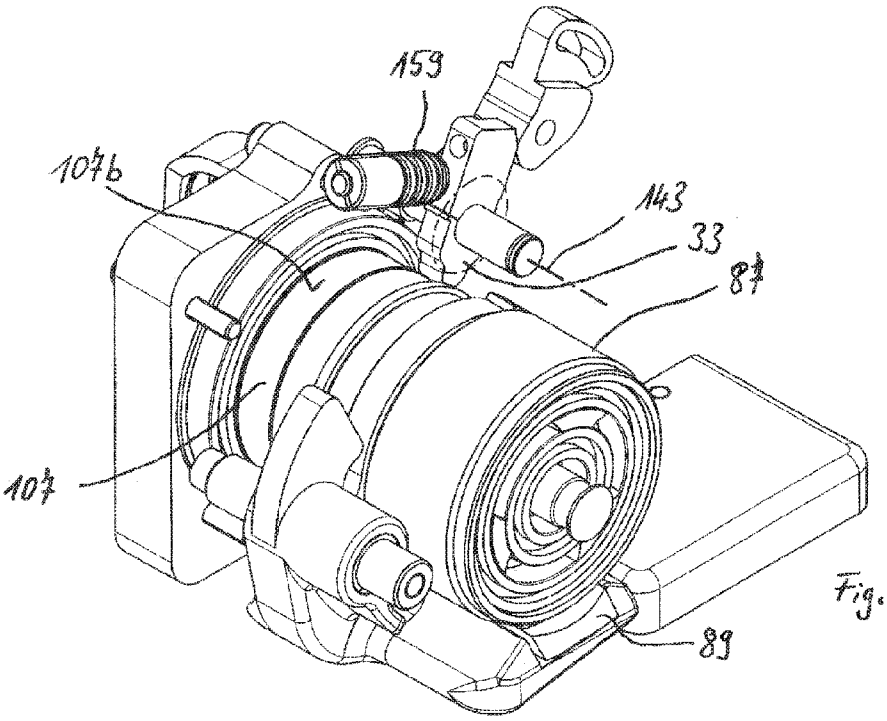

Fig. 12

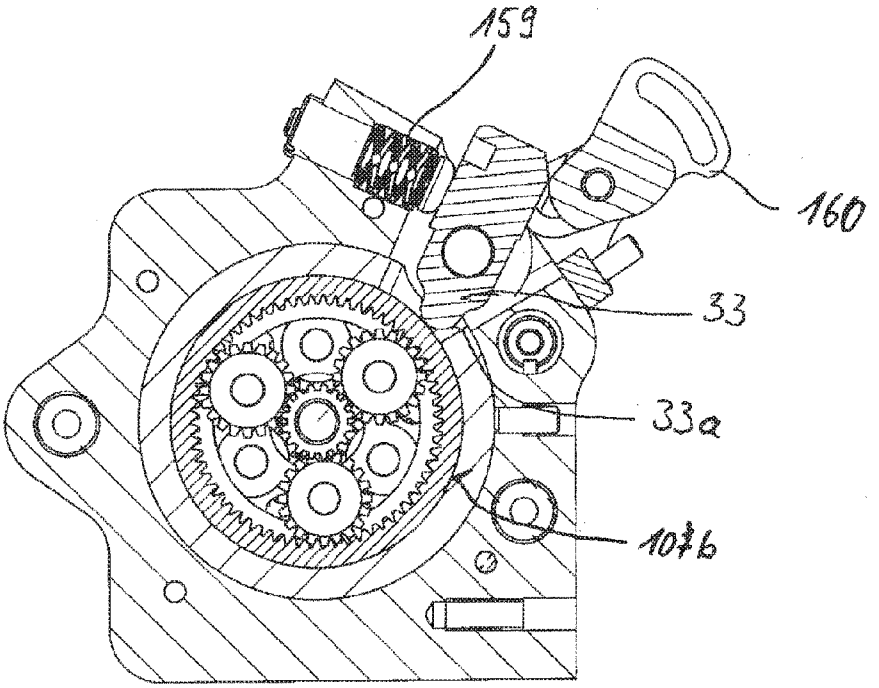

Fig. 13

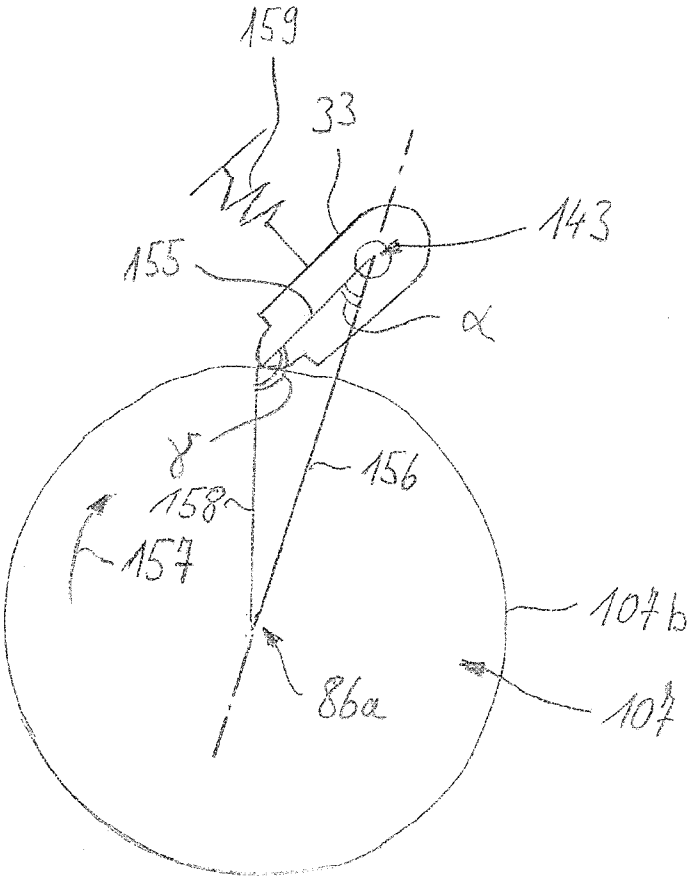

Fig. 14

STRAPPING ARRANGEMENT

[0001] This application is a national stage entry of PCT/CH2014/000059, filed on May 5, 2014, which claims priority to and the benefit of Switzerland Patent Application Nos.: (1) 443/14, filed on Mar. 24, 2014; (2) 1630/13, filed on Sep. 24, 2013; (3) 1629/13, filed on Sep. 24, 2014; (4) 911/13, filed on May 5, 2013; and (5) 910/13, filed on May 5, 2013, the entire contents of each of which are incorporated herein by reference.

[0002] The invention relates to a strapping apparatus for strapping articles for packing with a strapping band, which strapping apparatus has a tensioning device for imparting a band tension to a loop of a strapping band, wherein the tensioning device is equipped with a tensioning wheel which can be driven in rotation about a tensioning axis by means of a motor and which is provided for engaging into the strapping band, the tensioning device furthermore has a tensioning plate, wherein, during a tensioning process performed by the tensioning device, it is provided that a single-layer or multi-layer section of the strapping band is situated between the tensioning wheel and the tensioning plate and is in contact both with the tensioning wheel and with the tensioning plate, furthermore, the tensioning wheel and/or the tensioning plate are/is arranged on a rocker which is pivotable about a by means of a motor about a rocker axis in order to either increase or decrease a spacing between the tensioning wheel and the tensioning plate by way of a pivoting movement of the rocker, and a connecting device for producing a permanent connection, in particular a welded connection, at two regions, situated one above the other, of the loop of the strapping band by way of a connecting element, such as a welding element, which is provided for locally heating the strapping band.

[0003] Strapping apparatuses of said type are used for strapping articles for packing with a plastics band. For this purpose, a loop of the respective plastics band is placed around the article for packing. In general, the plastics band is in this case drawn off from a supply roll. After the loop has been placed all the way around the article for packing, the end region of the band overlaps a section of the band loop. The strapping apparatus is then applied to said two-layer region of the band, and here, the band is clamped in the strapping apparatus, a band tension is imparted to the band loop by means of the tensioning device, and a fastening is produced by friction welding on the loop between the two band layers. Here, pressure is exerted on the band by means of a friction shoe which moves in oscillating fashion in the region of two ends of the band loop. The pressure and the heat generated by the movement causes the band, which generally has plastic, to locally melt for a short period of time. This gives rise between the two band layers to a permanent connection, which can be released again at most with high force, between the two band layers. Thereafter, or approximately at the same time, the loop is severed from the supply roll. The respective article for packing has hereby been strapped.

[0004] Generic strapping apparatuses are provided for mobile use, wherein the appliances are intended to be carried by a user to the respective usage location and, there, should not be dependent on the use of externally supplied energy. In the case of known strapping appliances, the energy required for the intended use of such strapping appliances for tensioning a strapping band around articles for packing of any type and for producing a fastening is generally provided by an electric battery or by compressed air. By means of said energy, the band tension introduced into the band by means of the clamping device is generated, and a fastening is produced on the strapping band. Generic strapping apparatuses are furthermore provided for connecting only weldable plastics bands to one another.

[0005] In the case of mobile appliances, a low weight is of particular importance in order that the user of the strapping apparatus is subjected to the least possible physical burden when using the apparatus. Likewise, for ergonomic reasons, the most uniform possible distribution of the weight over the entire strapping apparatus should be provided, in particular in order to avoid a concentration of the weight in the head region of the strapping apparatus. Such a concentration leads to adverse handling characteristics of the apparatus. Furthermore, the most ergonomic possible and user-friendly handling of the strapping appliance is always sought. In particular, the possibility of incorrect operation and malfunctions should be as low as possible.

[0006] The invention is therefore based on the object of providing a generic, in particular mobile, strapping apparatus of the type mentioned in the introduction, which exhibits high functional reliability and in the case of which the intended belt tensions can be imparted to the belt reliably and with the least possible slippage.

[0007] According to the invention, said object is achieved, in the case of a strapping apparatus of the type mentioned in the introduction, by means of an actuating device of the strapping apparatus, which actuating device is equipped with a pushbutton/switch by means of which a switching state of a gearing of the strapping apparatus can be changed such that a drive movement of the drive device of the strapping apparatus leads either to the rotation of the tensioning wheel or to the pivoting movement of the rocker. Such a solution firstly has the advantage that the same gearing can be utilized both for the speed increase or speed reduction of the drive movement provided for the tensioning wheel by the drive device and for the driven movement of the rocker, and thus, despite the convenient solution of a driven rocker, no additional, separate gearing is required for this purpose. Despite the increase in comfort and functional reliability, these are not associated with any significant increase in weight. On the contrary, as the hitherto conventional long lever for the manual opening of the tensioning device can be omitted, weight reductions may even be possible with the invention, depending on the specific embodiment of the respective preferred strapping apparatus according to the invention. In further preferred embodiments, said advantage can be further enhanced if, for all of the driven movements provided in the respective strapping apparatus, the respective drive movement is provided by only one motor of the strapping apparatus, in particular by only one electric motor or by only one pneumatic motor.

[0008] A further embodiment of the strapping apparatus may provide that, in one of the switching states of the gearing, the pivoting movement, driven by the drive device, of the gearing leads to an increase in the spacing between the tensioning wheel and the tensioning plate.

[0009] A further embodiment of the strapping apparatus may provide that, by means of the pushbutton/switch, two switching elements provided for acting on the gearing, such as for example clamps, can be actuated, in particular can be actuated at least substantially simultaneously.

[0010] A further embodiment of the strapping apparatus may provide that, by means of the pushbutton/switch, switching elements which are provided for acting on different gearing elements of the gearing can be actuated.

[0011] A further embodiment of the strapping apparatus may provide that the at least two switching elements can be actuated by means of only one pushbutton/switch of the actuating device—and in particular with only one actuation of the pushbutton/switch.

[0012] A further embodiment of the strapping apparatus may provide that, after a tensioning process of the strapping band has been performed, an actuation of the pushbutton/switch leads to a reduction of the band tension in the band section that is in engagement with the tensioning wheel.

[0013] A further embodiment of the strapping apparatus may provide that an actuation of the pushbutton/switch for generating the switching state of the gearing is also provided for triggering further functions of the strapping apparatus, in particular for triggering the tensioning process and/or for triggering the production of the connection on the strapping band.

[0014] A further embodiment of the strapping apparatus may provide that an actuation of the pushbutton/switch is also provided for transferring the connecting device into its rest position and/or into its working position.

[0015] A further embodiment of the strapping apparatus may provide that, in addition to the pushbutton/switch, the actuation of which leads to the change in the switching state of the gearing, at least one further pushbutton/switch is provided, in particular for triggering the tensioning process and/or for triggering the production of the connection on the strapping band.

[0016] A further embodiment of the strapping apparatus may provide that, in addition to the pushbutton/switch, the actuation of which leads to the change in the switching state of the gearing, and in addition to a further pushbutton/switch, which is provided for triggering the tensioning process, at least one yet further pushbutton/switch is provided for triggering the production of the connection on the strapping band.

[0017] According to a further aspect of the invention, the invention also relates to a strapping apparatus in which the only one drive device, in particular the only one motor, can be triggered by means of an actuating device of the strapping apparatus, by means of which the tensioning wheel can be driven, by means of which the connecting device can be transferred into its working position, in which, by means of the connecting device, the permanent connection can be produced on the strapping band, the energy for the connecting device for producing the permanent connection is provided, and by means of which the rocker can be driven so as to generate the spacing between the tensioning wheel and the tensioning plate.

[0018] In the invention, it may expediently also be provided that, at least at times during the transmission of the motor-imparted drive movement to the tensioning wheel, preferably for as long as the tensioning wheel is in engagement with the band, a drive movement is transmitted by means of at least one transmission means of the strapping apparatus to the rocker, which is pivotable at least at times during the duration of the tensioning process, wherein the drive movement is provided for exerting a torque on the rocker. According to the invention, the torque exerted on the rocker can be utilized to increase the contact pressure force of the tensioning device against the strapping band. In a structurally simple solution, the torque exerted on the rocker by transmission means may originate from a motor, the drive torque of which is variable, increases the contact pressure force of the rocker against the band during the course of the tensioning process. It is preferable here if the motor-induced increase is realized such that it occurs in particular during or after an increase in the band tension. It is advantageous here if, for the generation of the motor-imparted torque for the rocker, a motor is used which also performs other drive movements. It is particularly expedient if the motor, and the drive movement thereof, used for driving the tensioning wheel is utilized here too. Firstly, it is possible in this way to eliminate a further motor, but nevertheless impart the function according to the invention. Secondly, the motor-imparted torque, which with increasing band tension normally also increases, can be utilized for increasing the contact pressure force. This permits, in a particularly simple manner terms of construction, a variable, tension-dependent contact pressure of the rocker against the band. Said contact pressure may preferably be proportional to the respectively acting band tension.

[0019] According to a further aspect of the invention, which is also of independent significance, it is also possible for there to be exerted on and transmitted to the rocker a torque which is based on a force exerted on the tensioning device by the band at a point of engagement of the band with the tensioning device. Said force, which is a reaction to the tension force imparted to the band by the driven tensioning wheel, can be picked off at a suitable location and transmitted to the rocker by way of transmission means. Here, in order to expend the least possible effort in terms of construction, it is preferably possible for the band tension force acting on the tensioning wheel to even be utilized at the tensioning wheel itself. This may be utilized in particular as a respectively presently acting torque on the tensioning wheel, which torque is introduced from the tensioning wheel into transmission means of the tensioning device and transferred from said transmission means to the rocker.

[0020] According to the invention, it can thus advantageously be provided that the motor-imparted drive movement for the tensioning device is, at least indirectly as a reaction, also used, utilizing the motor-driven rotational movement of the tensioning wheel and a pivotability of the rocker, in order, during the tensioning process, a torque derived from the tensioning wheel, which is in engagement with the strapping band, can be introduced by transmission means into the rocker, in order to increase a contact pressure force of the tensioning device against the band.

[0021] In a preferred embodiment of the invention, a gearing of the tensioning device, by means of which gearing a motor-imparted drive movement for the tensioning wheel is subjected to a speed reduction or speed increase, may entirely or partially be a constituent part of the transmission means by which the force which acts on the tensioning wheel and which results from the band tension is transmitted from the band to the rocker.

[0022] According to a further aspect, the invention can also be seen in the provision of means for the variable pressing, in a manner dependent on band tension, of the tensioning wheel or of the tensioning plate against the strapping band. The invention thus provides, during the tensioning phase, variable pressing, in a manner dependent on the band tension, of the tensioning device against the strapping band.

[0023] In particularly advantageous embodiments of the invention, the band tension generated as a result of the tensioning process is thus utilized in order, in an advantageous manner, with continuously increasing band tension, to also increase the contact pressure force of the tensioning wheel

and/or of the tensioning plate against the band, whereby the risk of "slippage", or of slipping of the tensioning wheel during the tensioning process, which risk likewise increases per se with increasing band tension, can be counteracted. With increasing band tension, the pressing force of the tensioning wheel against the band and the tensioning plate thus also increases. In such embodiments, the invention thus makes it possible for a high pressing force to be exerted on the band specifically when the band tension is already high and thus, in the attempt to further increase the band tension, the risk of slippage between the tensioning wheel and the band is likewise particularly high. By means of the pressing force which likewise increases in preferably automated fashion, that is to say without manual intervention, the increasing risk of slippage can be counteracted and thus the functional reliability and a rapid strapping process can be ensured even in the case of high band tensions. Since, for this purpose, the reaction of the strapping band to the action, specifically the introduced band tension, and transmission means are utilized which are derived from the tensioning device, in particular from the tensioning wheel, and are transmitted to the rocker, no intervention by a user is required in order to achieve the effect according to the invention; the effect according to the invention is advantageously realized automatically in the strapping apparatus.

[0024] In a preferred embodiment of the invention, the transmission means, which advantageously constitute an operative connection of the tensioning wheel to the rocker, may comprise a pivotable mounting of the rocker at least during the tensioning process and a rotatably mounted gearing element which, during the tensioning process, is operatively connected to the tensioning wheel. The reaction force of the band is preferably utilized as a torque and introduced into the rotatable gearing element, for example a planet carrier of a planetary gearing. The rotatable gearing element should be supported, against the rotational movement, on a support element. The reaction force of the tensioning wheel can then be introduced, by way of, or owing to, the support, into the rocker, whereby an additional torque acts on the rocker, which additional torque can be utilized to increase the contact pressure force of the rocker against the strapping band. The transmission means may advantageously be entirely or partially a constituent of the tensioning gearing by means of which a motor-imparted drive movement, or a drive movement originating from some other energy source, is transmitted at a suitable rotational speed to the tensioning wheel.

[0025] In a particularly preferred embodiment of the invention, which is also of independent significance, motor-imparted drive movements, with identical directions of rotation, of the only one motor may be utilized not only for driving the tensioning wheel during the tensioning of the strapping band but also for lifting the rocker. In addition to this, it is also possible, with the same drive movement, to realize the variable pressing, in a manner dependent on the band tension, of the tensioning wheel against the band to be tensioned. Here, the dependency is such that, with increasing band tension, the pressing force exerted on the band by the tensioning wheel also increases. Since, with increasing band tension, the risk of slippage occurring between the tensioning wheel and the band also increases, the risk of slippage can be counteracted through the measure of an increasing contact pressure. It is particularly preferable for the same motor direction of rotation as for the tensioning process to be utilized here. The motor-imparted drive movement during the tensioning of the belt may preferably be utilized such that, during the tensioning process of the strapping band by means of the tensioning wheel which engages into the tensioning band and which rotates counter to a band tension, an opposing force exerted on the tensioning wheel by the strapping band is utilized to increase the contact pressure of the tensioning wheel in the direction of the tensioning plate.

[0026] According to a further aspect of the invention, it is sought to make it possible, with little outlay in terms of construction and with easy handling, for a force which results from the band tension and which reacts on a gearing, and by means of which a drive movement is transmitted to the tensioning wheel, to be held and released. The invention thus relates to a blocking device for use in a strapping apparatus, by means of which blocking device a rotatable wheel, which is provided for transmitting a drive movement, in particular a gearing wheel of a tensioning device of the strapping apparatus, can be clamped. The blocking device according to the invention should have at least one clamping body which is pivotable about a pivot axis and which is arranged with a spacing to the wheel and which is pivotable from an enabling position into a blocking position in which it—preferably with a part of an arcuate contact surface—comes into contact with a substantially planar circumferential clamping surface, which is thus free from positive locking elements, of the wheel, wherein the clamping body has a pivot radius greater than a spacing of the pivot axis of the clamping body to the circumferential clamping surface of the wheel, and the direction of rotation of the clamping body around the pivot axis during the movement from the enabling position into a clamping position runs in an opposite direction of rotation to the wheel to be clamped.

[0027] With a blocking device of said type, it is possible in a simple manner in terms of construction to realize highly functionally reliable locking of rotating gearing wheels. The locking in the direction of rotation of the wheel can be maintained with little expenditure of force. The clamping force of the clamping body even automatically increases if it is attempted to rotate the wheel further by increasing the torque.

[0028] The blocking device according to the invention can advantageously be utilized in particular for the releasable blocking of a wheel of a gearing, which wheel belongs to a gearing intended for the transmission of a drive movement to a tensioning wheel of the tensioning device of a strapping apparatus. It may in this context be provided in particular for the clamping of a wheel of a planetary gearing intended for the transmission of the drive movement to the tensioning wheel. By means of, or at least with the aid of, clamping of the wheel to be clamped, it is preferably possible for one of at least two drive output directions of the gearing to be determined, in particular a drive output direction of the gearing to the tensioning wheel, such that the band can be tensioned.

[0029] It may furthermore advantageously be provided that, with a release of the clamping action, the band tension acting on the tensioning wheel and the gearing is also at least partially, preferably entirely, eliminated. Since, with such locking devices, relatively low release forces are required for eliminating the clamping action even in the presence of high band tension values, the invention yields particularly functionally reliable and easy-to-operate strapping apparatuses. The low operating or actuating forces also make it possible to dispense with a rocker lever such as has hitherto been used, in the case of already known strapping apparatuses, to generate

high torques for lifting the rocker from the tensioned band. Instead of a long rocker lever, it is now possible for a push-button or key to be used by means of which the tension-releasing process is performed.

[0030] Further preferred refinements of the invention will emerge from the claims, from the description and from the drawings.

[0031] The invention will be discussed in more detail on the basis of exemplary embodiments which are illustrated purely schematically in the figures, in which:

[0032] FIG. **1** shows one embodiment of a strapping apparatus according to the invention in a perspective illustration.

[0033] FIG. **1***a* shows a further example embodiment of a strapping apparatus according to the invention.

[0034] FIG. **1***b* shows a yet further example embodiment of a strapping apparatus according to the invention.

[0035] FIG. **2** is an exploded illustration of the tensioning device of the strapping apparatus from FIG. **1** together with the motor.

[0036] FIG. **3** is a perspective illustration of the tensioning and fastening device of the strapping apparatus from FIG. **1**.

[0037] FIG. **4** is a further perspective illustration of the tensioning and fastening device of the strapping apparatus from FIG. **1**.

[0038] FIG. **5** is an exploded illustration of a further exemplary embodiment of the tensioning device of the strapping apparatus from FIG. **1** together with the motor.

[0039] FIG. **6** is a perspective illustration of the tensioning and fastening device of the strapping apparatus from FIG. **1**.

[0040] FIG. **7** is a further perspective illustration of the tensioning and fastening device of the strapping apparatus from FIG. **1**.

[0041] FIG. **8** shows a side view of the tensioning device from FIG. **5**, in which a rocker is situated in a first pivoting end position.

[0042] FIG. **9** shows a side view of the tensioning device from FIG. **5**, in which the rocker is situated in a second pivoting end position.

[0043] FIG. **10** shows a side view of the tensioning device from FIG. **2**, in which the rocker is situated in a position with a high contact pressure force against a tensioning plate.

[0044] FIG. **11** shows a side view of the tensioning device from FIG. **2**, in which the rocker is situated in a position with a lower contact pressure force against a tensioning plate than in FIG. **10**.

[0045] FIG. **12** is a perspective partial illustration of the tensioning device and of the blocking device.

[0046] FIG. **13** is a sectional illustration of the tensioning and blocking device.

[0047] FIG. **14** is a diagrammatic illustration of the geometric relationships in a preferred blocking device.

[0048] The manually actuable strapping appliance **1** according to one embodiment of the invention shown in FIGS. **1** and **2** has a housing **2** which surrounds the mechanism of the strapping apparatus and on which there is formed a handle **3** for the handling of the appliance. The strapping appliance is furthermore equipped with a base plate **4**, the underside of which is provided for arrangement on an article to be packaged. All of the functional units of the strapping appliance **1** are fastened on the base plate **4** and on the carrier (not illustrated in any more detail) of the strapping appliance, said carrier being connected to the base plate.

[0049] By means of the strapping appliance **1**, a loop (not illustrated in any more detail in FIG. **1**) of a plastic band B, composed for example of polypropylene (PP) or polyester (PET), which loop has, beforehand, been placed around the article to be packaged, can be tensioned by means of a tensioning device **6** of the strapping apparatus. For this purpose, the tensioning device has a tensioning wheel **7** by means of which the band B can be gripped for a tensioning process. The tensioning wheel **7** is arranged on a pivotable rocker **8** which can be pivoted about a rocker pivot axis **8***a*. The tensioning wheel **7**, which is arranged with its axis of rotation having a spacing to the rocker pivot axis **8***a*, can, by means of a pivoting movement of the rocker **8** about the rocker pivot axis **8***a*, be transferred from one end position, with a spacing to a preferably curved tensioning plate **9** mounted on the base plate **4**, into a second end position, in which the tensioning wheel **7** is pressed against the tensioning plate **9**. By means of a corresponding motor-driven movement in the reverse direction of rotation about the rocker pivot axis **8***a*, the tensioning wheel **7** can be moved away from the tensioning plate **9** and pivoted back into its initial position, whereby the band situated between the tensioning wheel **7** and the tensioning plate **9** is released such that it can be removed.

[0050] During the use of the illustrated embodiment of a tensioning apparatus, two layers of the strapping band are situated between the tensioning wheel **7** and the tensioning plate, and are pressed against the tensioning plate by the tensioning wheel **7**. By rotation of the tensioning wheel **7**, it is then possible for the band loop to have imparted to it a band tension which is high enough for packaging purposes. The tensioning process, and the tensioning device and rocker **8** designed advantageously for this purpose, will be discussed in more detail below.

[0051] Subsequently, at a point of the band loop at which two layers of the band lie one above the other, welding of the two layers can be performed, in a manner known per se, by means of the friction welding device **12** of the strapping appliance. The band loop can hereby be permanently closed. In the preferred exemplary embodiment shown here, the friction welding and severing device **12** can be driven by the same, only one motor M of the strapping appliance, by means of which all other motor-driven movements are also performed. For this purpose, in a manner known per se, in the transmission direction from the motor M to the points at which the motor-imparted drive movement, there is provided a freewheel (not illustrated in any more detail) which has the effect that the drive movement is transmitted in the drive direction of rotation, respectively provided for the purpose, to the corresponding functional unit of the strapping appliance, and no transmission takes place in the other drive direction of rotation, respectively provided for this purpose, of the motor.

[0052] For this purpose, the friction welding device **12** is equipped with a welding shoe **13** (illustrated only in highly schematized form) which is, by means of the transfer device **14**, transferred from a rest position, with a spacing to the band, into a welding position, in which the welding shoe is pressed against the band. The welding shoe, which in this case is pressed against the strapping band by mechanical pressure, and the simultaneously performed oscillating movement of the welding shoe with a predetermined frequency, cause the two layers of the strapping band to melt. The locally plasticized or molten regions of the band B flow into one another and, after the band B cools, a connection between the two band layers then forms. If necessary, it is then possible for the

band loop to be severed from a supply roll of the band by means of a cutting device (not illustrated in any more detail) of the strapping appliance **1**.

[0053] The advancement of the tensioning wheel **7** in the direction of the tensioning plate **9**, the rotary drive of the tensioning wheel **7** about the tensioning axis **6***a*, the lifting of the tensioning wheel from the tensioning plate, the advancement of the friction welding device **12** by means of the transfer device **14** of the friction welding device **12**, and also the use of the friction welding device **12** per se, and the actuation of the cutting device, are performed using only one common electric motor M, which provides a respective drive movement for these components of the strapping appliance. For the supply of electricity to the motor M, there is arranged on the strapping appliance an exchangeable battery **15**, which can in particular be removed and exchanged for charging purposes, and which serves for storing electrical energy. A supply of other external auxiliary energy, such as for example compressed air or further electricity, may be provided, but is not provided in the case of the strapping appliance as per FIGS. **1** and **2**.

[0054] As illustrated in FIG. **4**, in the case of the strapping appliance according to the invention, provision is made for the drive movement of the motor M to be picked off at two points along the drive axis thereof, either for the tensioning device **6** or for the friction welding device **12**. For this purpose, the motor M can be operated in both of the two directions of rotation. The changeover of the transmission of the drive movement to the tensioning device **6** or to the friction welding device **12** is performed automatically, by way of a freewheel arranged on the drive shaft of the motor M (and not illustrated in any more detail), in a manner dependent on the direction of rotation of the drive shaft of the motor. In one direction of rotation of the drive shaft, the drive movement is transmitted to the tensioning device **6**. Owing to the freewheel, no drive movement is transmitted to the friction welding device **12** in this case. In the other direction of rotation, the tensioning device **6** has no drive movement imparted to it, and the friction welding device **12** is driven. In this embodiment, no manually performed switching processes are necessary in order to change the transmission direction of the motor-imparted drive movement. Such freewheels are already known in conjunction with strapping apparatuses, for which reason these will not be discussed in any more detail.

[0055] As is likewise illustrated in FIG. **4**, the motor transmission of the drive movement to the friction welding device **12** and transfer device **14** is performed by suitable means. Said means may for example be a toothed belt drive with an encircling, closed toothed belt which is guided over two toothed gears. One of the two toothed gears is arranged on the drive shaft of the electric motor M, and the other belongs to a gearing of the friction welding device **12**, by way of which the motor-imparted drive movement moves both the transfer device **14** and the welding shoe **13** of the friction welding device **12**. The welding shoe, pressed against two layers, lying one above the other, of the strapping band, can hereby be set in an oscillating motion with a predetermined frequency and amplitude, with which the two band layers are, in the region of the welding shoe, locally melted and welded to one another as a result of the subsequent cooling.

[0056] On the drive shaft of the motor, behind the toothed belt drive to the welding device as viewed from the motor M, there is situated a bevel gear **19**, which belongs to a bevel gear mechanism of the tensioning device, in the same way as a second bevel gear **20**, with which the former bevel gear meshes. On the same shaft as that on which the second bevel gear **20** is arranged, there is also situated a first toothed gear **21** of a further toothed belt drive **22**, which is furthermore guided over a second toothed gear **23**. The first toothed gear **21** of the toothed belt drive **22** is arranged rotationally conjointly on the shaft **24**.

[0057] Pushed onto the other end of the shaft **24** is the rocker **8** of the strapping appliance, which rocker is a constituent part of the tensioning device **6** and bears the tensioning wheel **7** and also a gearing, in this case a planetary gearing **26**, connected upstream of the tensioning wheel **7**, for which purpose suitable bearing points may be provided on the rocker **8**. The rocker **8** has been pushed onto the shaft **24** such that it is arranged and mounted so as to be pivotable about the longitudinal axis of the shaft **24**. The longitudinal axis of the shaft **24** is thus simultaneously the rocker pivot axis **8***a* about which the rocker **8** is pivotable.

[0058] The planetary gearing **26** may be in the form of a single-stage or multi-stage planetary gearing, in particular a two-stage or three-stage planetary gearing. An input-side externally toothed sun gear **30**, which belongs to the planetary gearing **26**, protrudes from that face side of the toothed gear **23** which faces toward the tensioning wheel **7**, the axis of rotation of which sun gear is identical to the axis of rotation **6***a* of the input-side toothed gear **23**. On a shaft of the toothed gear **23**, on which shaft the sun gear **30** is also formed in the exemplary embodiment, there is a freewheel **45**, which permits only one direction of rotation of the sun gear **30**, specifically the direction of rotation provided for the drive of the tensioning wheel. The sun gear **30** is led through an internal gear **27** and through a central recess of a planet carrier **25**, which internal gear and planet carrier are likewise constituent parts of the planetary gear **26**. As viewed from the input side of the planet gear, the planet carrier **25** is arranged, on the axis of the planetary gearing **26**, which corresponds to the tensioning axis **6***a*, behind the internal gear **27**. It would also be possible for the planet carrier to be designed so as to constitute a clamping gear, coupling gear or spur gear.

[0059] The internal gear **27** has, on its outer circumference, a cam **27***c* which is in engagement with a support **46** fastened to the base plate **4** of the strapping apparatus. The internally toothed internal gear **27** is supported here such that the cam **27***c*, within its engagement into the support **46**, for example into a recess **46***a* of the support, can perform slight relative movements. The internal gear **27** furthermore has an annular shoulder **27***a* on which there is arranged a rolling bearing **28** for the mounting of the planetary gear **26**.

[0060] The planet carrier **25**, the axis of which is in alignment with the tensioning axis **6***a*, is in engagement, by way of its three planet gears **25***b*, with an internal toothing of the input-side internal gear **27** of the planetary gearing **26**. The planet gears **25***b* of the planet carrier **25** are furthermore in engagement with the sun gear **30**, from which said planet gears can receive a drive movement and transmit said drive movement, with a corresponding speed reduction, to the internal gear **27**. In the case of a rotationally fixed arrangement of the planet carrier **25**, it is thus possible for a rotational movement of the sun gear **30** to be converted into a rotational movement of the internal gear **27**. In the exemplary embodiment, a first clamp **29** of a blocking or clamping device is in the form of a pivotable cam which can be placed in contact with a clamping surface **25***a* on the outer circumference of the planet carrier **25**, or which can be pivoted away from the

latter, so as to be spaced apart therefrom. Here, the cam is arranged such that, when the cam is in contact with the clamping surface **25***a*, a rotation of the input-side planet carrier **25** in the intended direction of rotation of the planet carrier **25** causes a further intensification of the clamping action. As a result of an advancement of the cam against the clamping surface **25***a* owing to a corresponding switching process, the planet carrier **25** can be blocked against rotation. Likewise by means of a switching process, the cam **29** can be moved away from the clamping surface **25***a*, and thus the planet carrier **25** can be released for rotational movements. Here, the switching process may trigger a pivoting movement of the clamp **29** about a switching axis **143**, this being triggered by actuation of a pushbutton **144**.

[0061] The sun gear **30** is furthermore arranged in the region of the axis of rotation **31** of an internal gear **32**, the non-toothed outer surface **32***a* of which is assigned to a second clamp **33**. The axis of rotation **31** is identical to, or in alignment with, the tensioning axis **6***a*. The clamp **33** which interacts with the outer surface **32***a* may, in basically the same way as the first clamp **29**, be in the form of a switchable cam which can be moved between two end positions, wherein in one position, the internal gear **32** is blocked against rotation, and in the other position, said internal gear is released for rotational movements. Furthermore, an internal toothing of the internal gear **32** is in engagement with three planet gears **34**, which are mounted on that face side of the following planet carrier **35** which faces toward the internal gear **32**. The planet gears **34** of the planet carrier **35** are furthermore in engagement with the sun gear **30** of the input-side toothed gear **23**, which projects into the internal gear **32**.

[0062] In the preferred embodiment described, the blocking device is designed such that always one, and only one, of the gears **25**, **32** is clamped against rotation, and the respective other gear **25**, **32** is free to perform rotational movements. It is thus possible, in a manner dependent on the positions of the blocking devices **29**, **33**, for a rotational movement of the toothed gear **23** and of the sun gear **30** to lead, on the one hand, to a rotation of the planet gear **35** about the tensioning axis **6***a* and axis of rotation **31** owing to a movement of the planet gears **34** in the internal toothing of the internal gear **32**. Alternatively, the rotation of the sun gear **30** leads, in a manner dependent on the positions of the locking device, to a rotation of the internal gear **32**. If the planet carrier **25** is not clamped by the blocking device, the rotating sun gear drives the planet gears **25***b* concomitantly such that the planet carrier **25** rotates and the internal gear **27** remains positionally fixed. By contrast, if the internal gear **32** is not clamped, a rotation of the sun gear **30** causes the planet gears **34** to be driven concomitantly, which planet gears in turn set the internal gear **32** in rotational motion. As the resistance to rotation in the further course of the planetary gear **26** to the tensioning wheel **7** is greater than the torque that has to be overcome in order to set the internal gear **32** in rotation, it is primarily the internal gear **32** that rotates in this case, and the tensioning gear **7** at least substantially does not rotate.

[0063] On the other face side, averted from the tensioning wheel **7**, of the planet carrier **35**, a further sun gear **36** is arranged rotationally conjointly on said planet carrier, which sun gear meshes with planet gears **41** of a further planet carrier **42**. A further sun gear **43**, which is directed toward the tensioning wheel **7** and which is connected rotationally conjointly to the planet carrier **42**, is led through a recess of the further planet carrier **37**, which is in the form of an internal gear. The sun gear **43** is in meshing engagement with planet gears **38**, facing toward the tensioning wheel **7**, of the further planet carrier **37**. The planet gears **38** of the second planet carrier **37** in turn mesh with an internal toothing of the tensioning wheel **7**, and drive the latter such that it performs its rotational movement about the tensioning axis **6***a*. Said rotational movement of the tensioning wheel **7**, which is equipped with a fine toothing (not illustrated) on its outer circumferential surface, is utilized in order, by way of the circumferential surface, to grip the band B and pull back the band of the band loop, whereby a band tension in the band loop is increased.

[0064] The third planet carrier **37** has, on its outer surface, a shoulder **37***a* which, by way of a rotational movement, can be placed in contact with a stop element **39**. The stop element **39** itself is fixed not to the rocker but to the base plate **4** or to some other carrier which does not participate in the pivoting movement of the rocker **8**. The stop element **39** is thus positionally fixed relative to the shoulder **37***a*.

[0065] During use for the strapping of articles for packing, the strapping appliance **1** operates as follows: After the respective article for packing has had a band loop with a commercially available plastic strapping band placed around it, said band loop is, in the region of the band end, in which the band loop is, in sections, in two layers, placed into the band strapping appliance, and the band end is held fixed in the strapping appliance by way of a band clamp (not illustrated any more detail). A section of the band B directly adjoining the band loop is placed, in two layers, over the tensioning plate **9** of the tensioning device **6**. The rocker **8** with the tensioning wheel **7** and the upstream gearing **26** is in this case situated in its upper end position, in which the tensioning wheel **7** is arranged with a spacing (with its greatest intended spacing) to the tensioning plate **9**, giving rise to the largest possible opening gap, which permits simple, convenient and thus also rapid placement of the band into the tensioning device. Subsequently, the rocker is lowered onto a tensioning plate **9**, which faces the tensioning wheel **7**, and is pressed against the band arranged between the tensioning plate **9** and the tensioning wheel **7**. Both said transfer movement of the tensioning wheel and the magnitude of the pressing force exerted on the band by the tensioning wheel at the start of the tensioning process may, in the described embodiment of the invention, be generated by one or more prestressed spring elements **44** (not illustrated). By actuation of a pushbutton **10**, the spring element can be enabled, and the strapping process as a whole, with its successively performed process steps "tensioning", "production of a fastening", "cutting", release of the tension from the band in the region of the tensioning device, and "lifting the rocker", can be triggered. It is possible for embodiments of the invention to be provided in which, then, there is preferably no need for further intervention by the user of the strapping appliance. By contrast, in the exemplary embodiment shown, for the initiation of the "release of the tension from the band" process, a further actuation of a further pushbutton is required; in the exemplary embodiment, this is the pushbutton **144**. Here, in the preferred exemplary embodiment, with the mechanically acting rocker pushbutton **144**, the blocking device with its two clamps **29**, **33** is acted on, and the latter is switched into or out of engagement with the planetary gearing.

[0066] After the tensioning wheel **7** automatically from the open position into its tensioning position (cf. tensioning position in FIG. **10** and open position in FIG. **11**), in which it lies on the band B and presses via the band against the tensioning

plate **9**, the motor-imparted drive movement is transmitted to the tensioning wheel **7**. The second clamp **33** is then transferred into its position in which it presses against the internal gear **32**. The internal gear **32** is hereby locked against rotational movements, and is blocked. By contrast, the first clamp **29** remains in a position spaced apart from the input-side planet carrier **25**, and releases the internal gear **27** for rotational movements. The motor-imparted drive movement, which, owing to the particular direction of rotation of the motor M provided, is transmitted via the bevel gear mechanism **19**, **20**, **21** to the second toothed belt drive **22** and thus to the toothed gear **23**, passes from here, in the sequence of the gearing elements mentioned below, via the input-side gearwheel **23**, the sun gear **30**, the planet gears **34**, the sun gear **36**, the planet gears **41**, the sun gear **43** and via the planet gears **38** to the tensioning wheel **7**. The tensioning wheel **7** can, inter alia by way of the multi-stage planetary gearing, be driven in the predetermined direction of rotation with a greatly speed-reduced rotational movement of the motor—and thus, if required, with correspondingly high torque.

[0067] In the "tensioning" operating state, as described just above, of the strapping apparatus, the driven tensioning wheel **7**, which is in engagement with the band, gives rise, depending on resistance force, which results from the band tension and which reacts on the tensioning wheel **7**, to a corresponding opposing force acting in the opposite direction on the tensioning wheel **7**. Said opposing force acts, in the opposite transmission direction to the motor-imparted drive movement, on all of the gearing elements of the multi-stage planetary gearing which participate in the transmission of the drive movement. If use is made of a gearing type other than a single-stage or multi-stage planetary gearing, the opposing force, which results from the already applied band tension and which is introduced into the respective gearing via the contact with the tensioning wheel, is also available at said gearing for utilization in the sense of the present invention. According to the invention, said opposing force can be used to improve the method conditions, in particular the functional reliability even in the case of high band tensions to be imparted. To utilize said opposing force for the purpose described below, it would thus be possible, in principle, to use each of said gearing elements for this purpose, in particular to pick off said opposing force and use it at each of said gearing elements.

[0068] In the exemplary embodiment, the planet carrier **37** is used for this purpose. Here, the planet carrier **37** is supported via the stop element **39** on the base plate **4**, whereby the entire tensioning device **6** is, about the rocker axis **8***a*, pressed against the band proportionally to the resistance force (band tension). The tensioning wheel **7** is thus pressed against the band B proportionally to the band tension. The band tension generated as a result of the tensioning process is utilized in order, in an advantageous manner, with continuously increasing band tension, to also increase the contact pressure force of the tensioning wheel **7** against the band B, whereby the risk of "slippage", or of slipping of the tensioning wheel **7** during the tensioning process, which risk likewise increases per se with increasing band tension, can be counteracted.

[0069] For this purpose, the planet carrier is formed with the engagement element **37***a*, which interacts with the positionally fixed stop element **39**. The engagement element, which is in the form of a cam and which is arranged on the outer circumference of the planet carrier and which projects substantially radially therefrom, is supported on the stop element **39**. As can be seen inter alia from FIG. **3**, the positionally fixed stop element **39** is, for this purpose, situated in the region of the head end of the strapping appliance. In the exemplary embodiment shown, the stop element **39** is situated on one side, specifically on the head-side end, of the tensioning axis **6***a*, and the rocker pivot axis **8***a*, which runs substantially parallel to said pivot axis, is situated on the other side of the tensioning axis **6***a*. The rocker **8**, on which the planet carrier **37** is arranged by way of a rolling bearing so as to be rotatable about the tensioning axis **6***a*, is also pivotable at least during the tensioning process, that is to say is not blocked against pivoting movements but is released for pivoting movements. Furthermore, during the tensioning process, the planet carrier **37** is rotatable about the tensioning axis **6***a*. The band tension generated in the band B in reaction to the tensioning process exerts on the tensioning wheel **7** a force which opposes the direction of rotation of the tensioning wheel during the tensioning process. Said reaction force is exerted by the tensioning wheel, via the planet carrier **37**, on the rocker **8** as a torque directed about the rocker pivot axis **8***a*, by means of which torque the planet carrier **37** is pressed with increased force against the band in the direction of the tensioning plate **9**. Here, the higher the band tension that has already been introduced into the band, the higher is the torque which results from this and from the motor-imparted drive movement that continues to act on the tensioning wheel **7**. Said torque, which is generated as a reaction, is in turn proportional to the resultant contact pressure force which is exerted by the tensioning wheel **7** on the band B and with which the band B is pressed against the tensioning plate **9** by the tensioning wheel **7**. A band tension increasing from the motor-imparted drive movement on the tensioning wheel **7** is thus associated, in the case of the invention, with an increasing contact pressure force of the tensioning device on the band.

[0070] After an end of the tensioning process and of the welding process which follows it in order to form a fastening, and after a motor-driven cutting process has been performed by way of a cutting apparatus (not illustrated in any more detail) which is integrated into the strapping apparatus, it should be possible for the band to be removed from the strapping apparatus without complication and quickly. To achieve this, a motor-imparted lifting movement of the tensioning wheel **7** out of the tensioning position is provided. For this purpose, the pushbutton **144** is actuated, and for as long as the pushbutton **144** is actuated, the rocker also remains in the open position, in which there is an adequate distance between the tensioning plate **9** and the tensioning wheel **7**. Releasing the pushbutton **144** causes the rocker to be closed, for example by spring force.

[0071] In the exemplary embodiment, for this purpose, the operative connection between the electric motor M and the tensioning wheel **7** is initially eliminated, and an operative connection is created between the electric motor M and the rocker **8**. This is achieved by switching the clamps **29**, **33**. The prior clamping of the internal gear **32** is eliminated by virtue of the second clamp **33** being removed from the outer surface **32***a* of the internal gear **32** and thereby releasing the internal gear **32** for rotational movements. Substantially at the same time or immediately thereafter, the first clamp **29** is lowered onto the clamping surface **25***a* of the planet carrier **25** and is placed in clamping contact with the latter. In this way, the input-side planet carrier **25** is fixed and blocked against a rotational movement about the tensioning axis **6***a*, along

which the planetary gearing as a whole is situated. This switching process is also performed by actuation of the rocker pushbutton **144**. The rocker pushbutton **144** may, for this purpose, be moved into a switching state other than that assumed previously, which rocker pushbutton may thus altogether have at least two different switching states.

[0072] The tensioning wheel **7** can thus rotate freely without drive and no longer has an operative connection, which could transmit a drive movement, to the electric motor M and to the sun gear **30**. A drive movement of the electric motor M in the same direction of rotation as during the tensioning process is now utilized, owing to the blocking of the input-side planet carrier **25** of the planetary gear set, such that the planet gears **25***b* of the spur gear **25**, during the rotational movement thereof, concomitantly drive the input-side internal gear **27**. The input-side internal gear **27** thus performs a rotational movement owing to the rotating planet gears **25***b*. The abutment and support of the internal gear **27** against the support element **46** leads to a pivoting movement of the internal gear **27** about the rocker axis **8***a*. The input-side internal gear **27**, which owing to the clamping is also connected rotationally conjointly to the rocker **8**, drives the rocker **8** concomitantly during said movement. This leads to lifting of the rocker **8** and of the tensioning device **6** fastened thereto, including the tensioning wheel **7**. The rotational movement of the rocker **8** may be limited by a stop or by an end position encoder, which, after the end position is reached in the open position of the rocker **8**, shuts down the motor M and triggers locking of the rocker. Owing to the motor-imparted lifting movement of the rocker **8** counter to the direction of action of the spring element **44**, the spring element **44** is also provided with an increased prestress force again. The strapping band B can now be removed from the strapping appliance **1**.

[0073] The strapping appliance is now ready for a subsequent new strapping operation, which can be performed in the same way as the strapping operation described above. For the subsequent lowering of the rocker **8** after the insertion of a new section of the strapping band B into the strapping apparatus **1**, the spring element **44** must be enabled again, which may be performed for example by way of an operable pushbutton on the strapping appliance. In the exemplary embodiment, for this purpose, the previously actuated pushbutton **144** is released. The spring force then pivots the rocker **8** in the opposite pivoting direction toward the tensioning plate, and, for the subsequent tensioning process, clamps the band with an initial contact pressure force between the tensioning wheel **7** and the tensioning plate **9**. The contact pressure force, which is variable during the further course of the tensioning process, increases in the described manner.

[0074] The actuation of the tensioning device **6**, the advancement of the friction welding device **13** by means of a transfer device of the friction welding device **13**, and also the use of the friction welding device per se, and the actuation of the cutting device, are performed using only one common electric motor **14**, which provides a respective drive movement for these components. The structural solution provided for this purpose may in principle correspond to that described in WO2009/129634 A1, the content of disclosure of which is hereby incorporated by reference.

[0075] In the present case, the portable, mobile strapping appliance **1** has an actuation element **10**, configured as a press switch, which is provided for setting the motor in operation and which will hereinafter be referred to as tensioning pushbutton. For the actuation element **10**, it is possible to set three modes by means of a mode switch which, in this exemplary embodiment according to the invention of a, is contained in the operating and display panel **25**. In the first mode, through subsequent actuation of the actuation element (pushbutton) **10**, both the tensioning device **6** and the friction welding device **13** are triggered in succession and in automated fashion, without further activation on the part of an operator being necessary. To set the second mode, the mode switch (not illustrated in any more detail) is switched into a second switching mode. The switching state of the mode switch is, with its settable modes and likewise the switching state of the actuation element **10**, presented and displayed on the display panel. Then, in the second possible mode, actuation of the pushbutton (tensioning pushbutton) **10** causes only the tensioning device **6** to be triggered. For the separate triggering of the friction welding device **13**, it is necessary for the tensioning pushbutton **10** to be actuated by the operator for a second time, by double-clicking the tensioning pushbutton **10** in the exemplary embodiment. The third mode is a type of semi-automatic mode, in which the actuation element provided as tensioning pushbutton **10** must be depressed until the tensioning force or tensile stress in the band, which can be preset in stages, is attained. In this mode, it is possible to interrupt the tensioning process by releasing the tensioning pushbutton **10**, for example in order for corner protectors to be fitted, under the strapping band, onto the article for strapping. The tensioning process can then be resumed by pressing the tensioning pushbutton **10**. Said third mode may be combined both with a separately triggered friction welding process and with an automatically following friction welding process. The electrical supply is ensured in each case by the battery **15**, which is in the form of a lithium-ion battery.

[0076] During the formation of a fastening, after the band has been placed, in the form of a loop, around the article for packing, is guided here in a predetermined manner in two layers through the tensioning device **6** and in two layers through the fastening device. In other embodiments of strapping appliances, it may also be provided that the band is guided in one layer through the tensioning device. The intended band tension is imparted by engagement of the tensioning device **6** into the upper layer, guided through the tensioning device **6**, of the band and by way of a pulling-back movement of the band. Thereafter, the welding shoe **13** is lowered in the direction of a counter support surface of the base plate **4**. Depending on the activated operating mode of the strapping appliance **1**, this takes place automatically following the completion of the tensioning process or as a result of separate triggering of the friction welding process by actuation of the pushbutton provided for the purpose. During the friction welding process, the band remains clamped between the tensioning wheel **7** and the tensioning plate (tensioning counter support) **9**, and is held there during the formation of a fastening. During this method step of the forming the strapping, the tensioning device has the function of a band clamp or of a clamping device which, by way of two interacting clamping elements, clamps the band between them. As a result of the lowering of the welding shoe **13**, the two band layers that have been guided through the fastening device are pressed against one another and against the counter support surface.

[0077] On the display and operating panel **25***a*, it is possible for different items of information and touch-sensitive actuation or input elements to be displayed alternately or simulta-

neously. It is possible for different display and input levels to be provided, which can be selected and deselected and in which in each case different items of information and actuation and input elements can be displayed. The displayed elements may in particular provide information regarding the state and settings of the strapping appliance and of its components. As actuation elements, it is possible in particular for multiple further pushbuttons, which can be triggered by touch, of the operating panel **25***a* to be displayed. With said pushbuttons, it is possible to preselect and set the above-described different modes of manual (MAN), semi-automatic (SEM) and automatic (AUTO) of the strapping appliance, and parameters of the strapping processes. Settable and displayed parameters may for example be the tensioning force, the welding time and the cooling time. The setting may be performed by adding or subtracting predefined steps of the respective value by actuating plus or minus pushbuttons, and by confirming the value to be set by means of the mode switch, which in this case functions as a confirmation pushbutton. By actuation of mode switch **17**, the set value is stored in the controller in order to be utilized during the subsequent strapping process. Likewise, the band type used may be displayed and selected by selecting from a predefined list of band types **26**. Furthermore, present operating states may be displayed, such as for example the state of discharge of the battery and, during the tensioning process, by way of a progress bar, the tensioning force already attained as a fraction of the set tensioning force to be attained.

[0078] The values preset in this way are displayed by the strapping appliance on the display panel and are utilized during strapping processes until the parameter values are changed again. The strapping processes themselves are triggered or started by way of the tensioning pushbutton **10**, as a further actuation element, which is arranged in an ergonomically expedient manner in the region of the front end of the handle of the strapping appliance **1**. To be able to place the band into the tensioning device, the rocker pushbutton **144** is arranged below the tensioning pushbutton **10**, which rocker pushbutton may for example, and preferably, be in the form of a press button. By pressing the rocker pushbutton **144**, the rocker **8** is opened, that is to say the rocker is pivoted with its tensioning plate **23** away from the tensioning wheel **7**, such that a gap is formed between the tensioning plate **23** and the tensioning wheel **7**. For as long as the rocker pushbutton **144** remains depressed, the tensioning plate **23** of the rocker is arranged with a spacing to the tensioning wheel **7**, such that the band can be placed into the tensioning device between the tensioning plate **23** and the tensioning wheel **7**. When the rocker pushbutton **144** is released, the rocker **8** pivots with the tensioning plate **23** in the direction of the tensioning wheel **7**, whereby the tensioning plate **9** bears against the underside of the band, and the top side of the band bears against the tensioning wheel **7**.

[0079] The rocker pushbutton **144**, which at the end of a strapping process is actuated inter alia for the removal of the band from the strapping apparatus, also gives rise, owing to the above-described change or elimination of the operative connection between the motor and the tensioning wheel, to a release of tension between the tensioning wheel **7** and the band, and subsequently to a spacing, generated by way of a motor-imparted movement, between tensioning wheel **7** and tensioning plate **9**. In the exemplary embodiment, the release of tension is a result of the mechanical switching process of the clamps **29**, **33** on the planetary gearing. Said process is performed regardless of whether the pushbutton **144** is in the form of a separate pushbutton or is in the form of a pushbutton with which further processes of the strapping appliance **1** can also be switched.

[0080] If the strapping appliance **1** is held by the handle **3**, the tensioning pushbutton **10** can be actuated using the thumb of the hand that is holding the handle **3**. The rocker pushbutton **144**, which is arranged on the underside of the handle **3**, can in this case be actuated in an ergonomically expedient manner by way of the index finger, without an adjustment of grip being necessary for this purpose. In other embodiments according to the invention, the rocker pushbutton **144** may also be arranged on the top side of the strapping appliance, in particular in the direct vicinity of the tensioning pushbutton **10**, such that both the tensioning pushbutton **10** and the rocker pushbutton **144** can be actuated using the thumb of the hand that is gripping the handle **3**. Here, the tensioning pushbutton **10** may be responsible for triggering both the tensioning process and the welding process, wherein, by setting the corresponding mode, it may be provided that a single press of the tensioning pushbutton **10** triggers both the tensioning process and the subsequent connecting process. By selecting a different operating mode, it is also possible for only the tensioning process to be initiated by way of a single press of the tensioning pushbutton. To carry out the connecting or welding process, it is then necessary for the tensioning pushbutton **10** to be pressed once again, for example by way of a double-click.

[0081] In an alternative embodiment to this, which is shown in FIG. **1***a*, is also possible for (only) one combination pushbutton **10** to be provided on the strapping appliance **1**, in particular in the region of the handle, which combination pushbutton has two actuation regions, one for the tensioning and welding, and one for the rocker actuation. A separate rocker pushbutton, such as is provided as rocker pushbutton **144** in the exemplary embodiment of FIG. **1**, can be omitted in the exemplary embodiment of FIG. **1***a*. Nevertheless, it is also optionally possible here for the tensioning and welding process to be triggered by way of only one actuation, or by way of mutually separate actuation processes, of one actuation region of the pushbutton **10**. The tensioning process may be triggered by way of a single actuation, and the connecting process may be triggered by way of a multiple actuation following the tensioning process, in particular by way of a double-click. The other actuation region is provided for the rocker actuation. Such a combination pushbutton may be situated for example at least approximately at that location on the strapping appliance at which the tensioning pushbutton **10** is arranged in FIGS. **1** and **2**. The various actuation regions **10***a*, **10***b* of the combination pushbutton **10** may for example be different end regions of the combination pushbutton.

[0082] In a further alternative embodiment, it is possible, in particular in the region of the handle **3**, for a dedicated pushbutton **10**, **144**, **145** to be provided for each of the three functions. In this case, to trigger the respective process, it may be provided that only a single actuation of the respective button **10**, **144**, **145** is required in each case. As shown in the corresponding exemplary embodiment of FIG. **1***b*, the pushbutton **10** is provided such that, when actuated, it triggers the tensioning process, triggers the transfer device **14** for the transfer of the connecting device into its working position and back into its rest position, and triggers the connecting device to produce the connection on the strapping band.

[0083] In a yet further embodiment of multiple further embodiments, it is possible, by means of a separate pushbutton **145**, for only the connecting process, in this case the welding process, to be triggered, whereas all of the other processes in the strapping appliance, in particular the tensioning process and the movement of the rocker and the release of tension, are triggered by means of only one further pushbutton **10** or pushbutton **144**. The actuation of the pushbutton **10** or of the pushbutton **144** of these embodiments may in this case involve only a single actuation or a multiple actuation.

[0084] In all embodiments, it is preferable if the pushbuttons assigned to the tensioning process and to the welding process trigger electrical switching processes which are supplied to the controller. By contrast, the actuation of the rocker pushbutton **144** may preferably be electromechanically transmitted to the rocker and trigger a pivoting movement of the rocker. It is likewise possible for one or more additional drive elements to be provided which trigger and perform the pivoting process of the rocker and which are electrically actuated.

[0085] All refinements of the described operating concepts may also be of independent significance and constitute independent inventions.

[0086] FIGS. **5** to **9** illustrate a further exemplary embodiment of a strapping appliance according to the invention. With regard to its external appearance, said further exemplary embodiment may also correspond to the illustration of FIG. **1**. The basic construction of said embodiment of the strapping appliance may also correspond to that of the preferred embodiment according to the invention discussed above. Accordingly, in this embodiment, too, only one motor M is used, which is provided the welding device **12** (not shown in FIG. **5**) and severing device, on the one hand, in one of the two motor directions of rotation, and the tensioning device **6**, on the other hand, in the other motor direction of rotation. The selective drive of either the welding device and severing device, on the one hand, or of the tensioning device **6**, on the other hand, is performed by way of a freewheel and different directions of rotation of the motor M.

[0087] Likewise, the embodiment has a pivotable rocker **80**, which is motor-driven about a rocker axis of rotation **80***a*, of the tensioning device **86**. By contrast to the preferred exemplary embodiment discussed above, it is not the tensioning wheel **87** but the tensioning plate **89** that is arranged on the pivotable rocker **80** here, the rocker pivot axis **80***a* of which runs parallel to the tensioning axis **86***a*. The motor-imparted drive movement with the direction of rotation utilized for rotational movements about the tensioning axis **86***a* is utilized in this exemplary embodiment, too, for the pivoting movement of the rocker **80**. In this embodiment, too, the rocker pivot axis **80***a* runs substantially parallel to the tensioning axis **86***a*, about which the tensioning wheel is mounted so as to be rotatable. The rotational movement of the motor is, downstream of a point at which the motor-imparted drive movement is utilized for the welding device, transmitted via a bevel gear pair **99**, **100** to a planetary gearing **106** and from the latter to the tensioning wheel **87**. By means of a freewheel **125** arranged on the shaft of an input-side sun gear **110**, it is ensured that the input side of the planetary gear **106** can rotate only in one direction of rotation. The planetary gear **106** is equipped with gearing elements which, as in the preferred exemplary embodiment described above, can be selectively locked by means of a blocking device which has of two clamps **29**, **33**, whereby the drive movement can be transmitted either to the tensioning wheel **87** or to the rocker **80**.

[0088] To open the tensioning device **86**, the internal gear **107** is released by the blocking device, that is to say the clamp **33** is not in clamping engagement with the internal gear **107**. The tensioning wheel **87** can thus rotate freely, without an operative connection to the motor M. Any band tension still exerted, as a reaction, on the tensioning wheel **87** by the strapping band B from the immediately preceding tensioning process is thereby disengaged from the tensioning wheel **87** and from the gearing **106** connected upstream of the tensioning wheel. By means of the clamp **29**, the spur gear in the form of planet carrier **105** is blocked, the axis of rotation of said spur gear being in alignment with the tensioning axis **86***a*, that is to say the axis of rotation of the tensioning wheel **87**. Owing to the releasable rotational locking of the planet carrier **105** performed by means of the clamp **29**, the motor-imparted drive movement transmitted by the bevel gear **100** to the input-side sun gear **110** can not to a rotation of the planet carrier **105** but to rotational movements of the planet gears **105***b* of the planet carrier **105**. The internal toothing, which meshes with said planet gears **105***b*, of the internal gear **109** sets the latter in rotational motion. As can be seen in particular in FIG. **7**, an external toothing **109***c* of the internal gear **109** is in engagement with an external toothing **150***c* of a circular arc segment **150**, which is arranged positionally fixedly on one end of a connecting shaft **151**. The connection axis **151***a* of the connecting shaft **151** runs parallel to the positionally fixed tensioning axis **86***a* of this exemplary embodiment. Instead of the two external toothings **109***c*, **150***c*, it would also be possible for the internal gear **109** to be supported via a cam on a support element, wherein then, either the cam or the support element should be neither fastened to the internal gear **109** nor of movable form, and the other of the two elements should be arranged on the internal gear **109**.

[0089] The rotational movement of the internal gear **109** and the engagement of the internal gear **109** into the circular arc segment **150** lead to a rotational movement of the connecting shaft **151** about the connection axis **151***a*. A spur gear **152** arranged on the other end of the connecting shaft **151** engages into an external toothing **117***c* of the planet carrier **117** and hereby transmits the rotational movement about the connection axis **151***a* to the planet carrier **117**. In relation to the tensioning axis **86***a*, the connection axis **151***a* is situated on one side and the rocker pivot axis **80***a* is situated on the other side of the tensioning axis **86***a*, wherein the rocker pivot axis **80***a* is situated on the side of the head-side end of the strapping appliance.

[0090] The planet carrier **117** belongs to the drive train which is provided for the drive movement of the tensioning wheel **87**. The operative connection of said drive train to the motor M is presently interrupted owing to the above-described switching position of the blocking device. Thus, at the above-described point in time in the method, there is no operative connection of the motor M to the tensioning wheel **87** in order to drive the latter. As a result of the rotational movement transmitted to the planet carrier **117**, the planet carrier **117** rotates about the tensioning axis **86***a* and, by way of its cam **117***a* arranged on its outer circumferential surface, concomitantly drives a driver **80***c* of the rocker **80**. The rocker **80**, which is arcuate in plan view, hereby rotates, and is opened.

[0091] The rocker **80**, which is mounted so as to be rotatable about the rocker axis **80***a* and which has approximately

the shape of an arc segment, is arranged with its lower free end below the tensioning wheel **87**, such that the tensioning plate **89** arranged in the region of the free end of the rocker **80** can likewise be arranged immediately below the tensioning wheel **87**. To arrange the tensioning plate **89** with a spacing to the tensioning wheel **87**, the above-described motor-driven movement of the rocker **80** in the direction of rotation as per arrow **112** (FIG. **6**) is utilized, by means of which the rocker **80** is opened, as described, and a spacing between the tensioning wheel **87** and the tensioning plate **89** is increased. The opening movement may be limited by a stop. The rocker **80**, which is opened in motor-driven fashion, now permits a removal of the tensioned and closed strapping loop from the strapping appliance. After the finished strap has been removed, the end of a new strapping loop can be inserted between the tensioning plate and the tensioning wheel for a subsequent tensioning process. Under the action of the restoring force of the spring element **124**, which was previously tensioned during the opening movement, the rocker **80** can be moved toward the tensioning wheel again and can press the band against the tensioning wheel with an initial contact pressure force for the tensioning process. To use the spring force and thereby move the rocker **80** in the direction of rotation as per arrow **113** in the direction of the tensioning wheel **87**, it may be provided that a pushbutton or some other actuation element is actuated, by means of which the spring force is enabled for acting on the rocker. A release of the pushbutton **10** may also be implemented here.

[0092] For the tensioning of the strapping band B be arranged between the tensioning wheel **87** and the tensioning plate **89**, the internal gear **107** is, at its outer circumferential surface, clamped against rotational movements by means of the clamp **33**. The planet carrier **105** is not clamped, and can thus rotate in the same way as the connecting shaft **8**. The motor-imparted drive movement from the sun gear **30** into the planetary gearing **106** arranged on the tensioning axis **86***a* is transmitted through the planet carrier **105** and the internal gear **107** to the planet gears **114** of the second planet carrier **115**, and the latter is set in rotation. A sun gear (not visible in the illustration of FIG. **5**) drives the planet gears **121** in a downstream further stage of the planetary gear **106**. The planet carrier **122** of said stage also rotates. The sun gear **123** of the latter stage is also led through the further planet carrier **117**, and drives the planet gears **118** of said further stage, which in turn mesh with an internal toothing of the tensioning wheel **87**. The tensioning wheel **87** is thus driven in the tensioning direction by way of the single-stage or multi-stage planetary gear **106**, and the inserted band B is tensioned.

[0093] In the above-described "tensioning" operating state, in which the tensioning wheel **87** is in engagement with the band B, the band tension gives rise to a resistance force, which is exerted in the form of a restoring torque on the rotating tensioning wheel **87** by the band B. The magnitude of said resistance force is variable, and is proportional to the magnitude of the imparted band tension. Said resistance force acts in opposition to the motor-imparted drive torque which acts in the gearing elements that participate in the transmission of the drive movement. In the exemplary embodiment, the planet carrier **117** is supported by way of a cam **117***b*, which has the function of a stop, against the rocker **80**. The planet carrier **117**, which rotates in a suitable direction of rotation owing to the motor-imparted drive movement, bears by way of its cam **117***b* against a driver **80***b* of the rocker, and thereby rotates the latter toward the tensioning wheel in a movement about the rocker axis **80***a*, as per arrow **113** (FIG. **6**). It may be the case here that no noticeable rotational movement about the rocker axis **80***a* is actually performed, but rather substantially only the torque about the rocker axis **80***a* is increased. In both cases, however, the contact pressure force with which the rocker **80** presses the tensioning plate **89** or the band against the tensioning wheel **87** is increased. Said increase generally does not take place in a single step. The increase of the contact pressure force of the rocker against the band, which increase can ultimately be attributed to the motor-imparted drive movement and the already prevailing band tension and takes place as a result of engagement into the tensioning gearing **106**, is proportional to the resistance or restoring force which prevails in each case in the band and which, at the point of engagement into the band, is exerted by the band on the tensioning plate **89** and on the tensioning wheel **87** as a resistance force which opposes a maintaining or further increase of the band tension. For as long as an increase in the band tension occurs as a result of the tensioning process, the resistance force, and the contact pressure force resulting therefrom, also increase.

[0094] FIGS. **8** and **9** illustrate the end positions of the rocker **80** that are possible owing to the pivotability of the rocker for opening and closing purposes, on the one hand, and for increasing the contact pressure force against the band, on the other hand. As is shown in FIG. **8**, in one of the two end positions, the tensioning plate **89**, owing to contact of the cam **117***b* of the planet carrier **117** against a contour of the driver **80***b* and a direction of rotation of the planet carrier clockwise (in relation to the illustration of FIG. **8**), the rocker is rotated counterclockwise about its rocker pivot axis. Here, the driver **80***b* and the cam **117***b* act in the manner of a lever which imparts a torque counterclockwise about the rocker pivot axis **80***a*.

[0095] FIG. **9** shows the end position of the open rocker. Here, the planet carrier **117** is rotating in the opposite direction in relation to FIG. **8**, and has thereby abutted against the driver **80***c* of the rocker **80**. The driver **80***c* is, in relation to the rocker pivot axis **80***a* and the other driver **80***b*, situated on the other side of the rocker pivot axis **80***a*. In the usage position of the strapping appliance with a horizontal orientation of the base plate, the driver **80***b* is situated above the rocker pivot axis **80***a*, and the driver **80***c* is situated below the rocker pivot axis **80***a*. In this way, in the illustration of FIG. **9**, the rocker has pivoted clockwise and has thereby formed a spacing to the tensioning wheel **87**.

[0096] FIG. **12** shows a perspective partial view of the tensioning device of the second exemplary embodiment, in which only one of the two clamps is illustrated. Here, the clamp **33** is in abutment against the planar circumferential surface **107***b*, which is substantially exactly circular in cross section, of the internal gear **107**. FIG. **13** is a sectional illustration through the internal gear **107** and the clamp **33**. By means of the clamp **33** of the blocking device, the internal gear can be selectively clamped against rotational movements or released again. Each of the clamping means provided in the strapping apparatuses as per FIGS. **2-11** may preferably be designed correspondingly to the blocking device described here, though conventional blocking devices are also possible. In the case of the preferred clamping means according to the invention, an at least approximately planar circular or circular arc-shaped circumferential surface of the wheel interacts with a pivotable clamping element or clamping body. The circumferential surface **107***b*, which functions as clamping surface,

of the illustrated preferred exemplary embodiment has no detent elements by means of which a clamping action based on positively locking engagement of a clamping element into a detent element or into a detent recess is provided.

[0097] The clamping element **33** is mounted so as to be pivotable about the switching and pivot axis **143**, wherein the switching axis **143** of the clamping element **33** runs parallel to the axis of rotation of the wheel **107** to be clamped. The switching axis **143** runs in the region of an end of the cam-shaped clamping element **33**. In the region of the other end of the clamping element, there is provided an arcuate contact surface **33***a* which is provided for contact with the clamping surface **107***b* of the wheel to be clamped. Owing to the circular form of the clamping surface **109***b* and the arcuate form of the contact surface **33***a* (as seen in side view), substantially linear contact arises when the clamping element **33** comes into contact with the circumferential surface **107***b*, wherein said contact line runs perpendicular to the plane of the drawing of FIG. **13**.

[0098] As can be seen from FIG. **13**, the clamping element **33** is arranged relative to the wheel **107** to be clamped such that the contact line of the contact surface **33***a* has a spacing **105** to its pivot axis **143**, said spacing being greater than the spacing of the pivot axis **143** to the clamping surface **107***b*. In this way, during a pivoting movement of the clamping element **33** from its release position into a clamping position, comes into contact with the clamping surface **107***b* already at a point which lies ahead of a straight connecting line **156** between the axis of rotation of the wheel **107** and the pivot axis **143** of the clamping element. In relation to the intended direction of rotation **157** of the wheel **107** to be clamped, the contact line is situated ahead of the (imaginary) connecting line **156**. The rotation of the wheel **107** is braked, and can continue at most only slightly. A further rotation counter to the clamping action, which increases in the process, intensifies the clamping action further and intensifies a wedging action, which increases in the process, of the clamping element **33** against the wheel **107**. Owing to these geometric relationships, the clamp **33** cannot pass the connecting line **156** in the direction of rotation of the wheel, and the pivoting movement of said clamp stops before the connecting line **156** and presses against the clamping surface **107***b*. In an end position which substantially corresponds already to the position of initial contact with the clamping element **33**, the wheel **107** is clamped against the cam-shaped clamping element **33**. A further movement is no longer possible, even with an arbitrarily high torque.

[0099] FIG. **14** illustrates the geometric relationships in the clamping situation. Here, too, the connecting line between the axis of rotation **86***a* of the wheel **107** and the pivot axis **143** is denoted by **156**. The contact surface (circumference) of the wheel could be smooth or slightly structured. The radius of the wheel at the contact point with the cam is denoted by **158**, and the pivot radius of the clamping element **33** at the contact point is denoted by **155**. The pivot radius **155** at the contact point encloses an angle α with the connecting line **156**, and the radius **158** of the wheel **107** encloses an angle γ with the pivot radius **155** (in each case at the contact point). In the exemplary embodiment, the geometric relationships are configured such that, in the clamping position, in which the wheel **107** is blocked against rotational movements in the intended direction of rotation, the angle γ is at least approximately 155°. In tests, it was also possible to achieve good results with an angle from a range from 130° to 170°, in particular from 148° to 163°. The angle α should advantageously be greater than or equal to 7°. In the exemplary embodiment, it is 9°. In other embodiments, it may also be selected from a range from 7° to 40°.

[0100] In the preferred embodiments of the invention discussed here, if the wedging action is sufficiently intense, it is not imperatively necessary for the position of the cam in its clamping position to be held by way of an externally implemented measure. This arises simply from the fact that the wheel **107** is rotatable only in one direction of rotation, and precisely this is releasably blocked by the clamp **33**. In preferred embodiments of the invention, the cam-shaped clamping element is held in position by the spring force of a spring element **159**. For this purpose, the spring element **159** bears against the clamping element above the switching axis **143**, and rotates and/or holds the clamping element **29** in its clamping position. To remove the clamping element from its clamping position, the spring force must be overcome by means of a switch **160**. By means of the switch **160**, both clamps **29** and **33** can be actuated simultaneously. Depending on the arrangement of the switch/pushbutton, it is possible, by pulling or pushing the switch, for the spring force to be overcome and for the internal gear **107** to be released from the clamp **33** and for the planet carrier **105** to be blocked. In the case of the respective other movement of the switch/pushbutton, the spring force has the effect of releasing the clamp **29** and the planet carrier **105** again, while the clamp **33** blocks the internal gear **107**.

[0101] The different operation concepts for a strapping appliance, in particular those shown in FIGS. **1**, **1***a* and **1***b*, and operating concepts described above may also be provided for this exemplary embodiment of a strapping appliance according to the invention.

List of reference designations

1	Strapping apparatus
2	Housing
3	Handle
4	Base plate
6	Tensioning device
6a	Tensioning axis
7	Tensioning wheel
8	Rocker
8a	Rocker pivot axis
9	Tensioning plate
10	Pushbutton
12	Friction welding device
13	Welding shoe
14	Transfer device
15	Battery
19	Bevel gear
20	Bevel gear
21	Toothed gear
22	Toothed belt drive
23	Toothed gear
24	Shaft
25	Planet carrier
25a	Clamping surface
25b	Planet gears
26	Gearing
27	Internal gear
27a	Shoulder
27c	Cam
28	Rolling bearing
29	First clamp
29a	Arcuate contact surface
30	Sun gear

-continued

List of reference designations	
31	Axis of rotation of gearing and tensioning wheel
32	Internal gear
32a	Outer surface
33	Second clamp
34	Planet gear
35	Planet carrier
36	Sun gear
37	Planet carrier
37a	Shoulder
38	Planet gear
39	Stop element
40	Arrow
41	Planet gear
42	Planet carrier
43	Sun gear
44	Spring element (restoring spring)
45	Freewheel
46	Support
46a	Recess
80	Pivotable rocker
80a	Rocker pivot axis
80b	Driver
80c	Driver
86	Tensioning device
86a	Tensioning axis
87	Tensioning wheel
89	Tensioning plate
99	Bevel gear
100	Bevel gear
105	Spur gear (planet carrier)
105b	Planet gear
106	Gearing
107	Internal gear
107b	Circumferential surface
109	Internal gear
109b	Circumferential surface
109c	External toothing
110	Sun gear
112	Arrow
113	Arrow
114	Planet gears
115	Planet carrier
117	Planet carrier
117b	Toothing
117a	Cam
117b	Cam
117c	Toothing
118	Planet gear
121	Planet gear
122	Planet carrier
123	Sun gear
124	Spring element
125	Freewheel
143	Switching axis
144	Pushbutton
150	Circular arc segment
150c	Toothing
151	Connecting shaft
151a	Connection axis
155	Spacing/Pivot radius
156	Connecting line
157	Direction of rotation
158	Radius
159	Spring element
160	Switch
B	Band
M	Motor

1-19. (canceled)

20: A strapping apparatus comprising:

a pivotable rocker;

a tensioning device configured to apply a band tension to a loop of a strapping band, the tensioning device including: (1) a tensioning wheel rotatable about a tensioning axis and configured to engage the strapping band, and (2) a tensioning plate, wherein:

(1) the tensioning wheel and the tensioning plate are positioned relative to one another such that, during a tensioning process, a portion of the strapping band positioned between the tensioning wheel and the tensioning plate is in contact with both the tensioning wheel and the tensioning plate; and

(2) at least one of the tensioning wheel and the tensioning plate is arranged on the rocker;

a motor operatively coupled to the rocker and configured to pivot the rocker about a rocker axis to change a spacing between the tensioning wheel and the tensioning plate;

a connecting device configured to connect to one another two regions of the loop of the strapping band situated one atop the other; and

an actuating device actuatable to change a switching state of gearing of the strapping apparatus such that a drive movement of the motor leads either to the tensioning wheel rotating or the rocker pivoting.

21: The strapping apparatus of claim **20**, wherein the motor is the only motor of the strapping apparatus and the drive movement from the only one motor can be transmitted to either the tensioning wheel or the rocker.

22: The strapping apparatus of claim **20**, wherein in one of the switching states of the gearing, the pivoting movement, driven by the motor, of the gearing leads to an increase in the spacing between the tensioning wheel and the tensioning plate.

23: The strapping apparatus of claim **20**, wherein the actuating device is actuatable to substantially simultaneously actuate two switching elements configured to act on the gearing.

24: The strapping apparatus of claim **23**, wherein the two switching elements are configured to act on different gearing elements of the gearing.

25: The strapping apparatus of claim **23**, wherein the two switching elements are actuatable via only one actuation of the actuating device.

26: The strapping apparatus of claim **20**, wherein after the tensioning process has been performed, an actuation of the actuating device causes a reduction of the band tension in the portion of the strapping band in engagement with the tensioning wheel.

27: The strapping apparatus of claim **20**, wherein an actuation of the actuating device is configured to trigger at least one additional function including initiation of at least one of the tensioning process and a connecting process for connecting the two regions of the loop of the strapping band.

28: The strapping apparatus of claim **20**, wherein an actuation of the actuating device is also configured to cause the connecting device to transfer between its rest position its working position.

29: The strapping apparatus of claim **20**, which includes a second actuating device actuatable to trigger at least one of the tensioning process and a connecting process for connecting the two regions of the loop of the strapping band.

30: The strapping apparatus of claim **20**, which includes a second actuating device actuatable to trigger the tensioning process and a third actuating device actuatable to trigger a connecting process for connecting the two regions of the loop of the strapping band.

31: A strapping apparatus comprising:
a pivotable rocker;
a tensioning device configured to apply a band tension to a loop of a strapping band, the tensioning device including: (1) a tensioning wheel rotatable about a tensioning axis and configured to engage the strapping band, and (2) a tensioning plate, wherein:
(1) the tensioning wheel and the tensioning plate are positioned relative to one another such that, during a tensioning process, a portion of the strapping band positioned between the tensioning wheel and the tensioning plate is in contact with both the tensioning wheel and the tensioning plate; and
(2) at least one of the tensioning wheel and the tensioning plate is arranged on the rocker;
a motor operatively coupled to the rocker and configured to pivot the rocker about a rocker axis to change a spacing between the tensioning wheel and the tensioning plate;
a connecting device configured to connect to one another two regions of the loop of the strapping band situated one atop the other; and
an actuating device actuatable to cause the motor to drive the tensioning wheel, cause the connecting device to transfer from a rest position into a working position, connect the two regions of the loop of strapping band, and drive the rocker to generate the spacing between the tensioning wheel and the tensioning plate.

32: The strapping apparatus of claim **31**, wherein the actuating device is the only actuating device configured to cause the motor to operate.

33: The strapping apparatus of claim **31**, wherein the actuating device is actuatable to cause multiple functions to be performed.

34: The strapping apparatus of claim **33**, wherein different quantities of successive actuations of the actuating device cause performance of different functions.

35: The strapping apparatus of claim **31**, which includes a second actuating device actuatable to actuatable to trigger at least one of the tensioning process and a connecting process for connecting the two regions of the loop of the strapping band and a third actuating device actuatable to generate the spacing between the tensioning wheel and the tensioning plate.

36: The strapping apparatus of claim **31**, which includes a second actuating device actuatable to release tension in the portion of the strapping band in engagement with the tensioning wheel.

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